Final
Environmental Assessment for the Falcon Launch Vehicle Program

Prepared for:

Space Exploration Technologies Corporation
1310 E. Grand Avenue
El Segundo, California 90245

July 18, 2003

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Prepared by:

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, California 93110

July 18, 2003

FINAL
FINDING OF NO SIGNIFICANT IMPACT FOR THE FALCON LAUNCH VEHICLE PROGRAM AT VANDENBERG AIR FORCE BASE

1.0 INTRODUCTION

An Environmental Assessment (EA) (see attached) has been prepared to evaluate the potential impacts associated with implementing the proposed Falcon Launch Vehicle Program at Vandenberg Air Force Base (AFB), California. The EA for the Falcon Launch Vehicle Program is incorporated by reference. The Falcon Launch Vehicle Program is a commercial venture by Space Exploration Technologies, Inc. (Space X). Space X is a privately held company that is developing the Falcon Launch Vehicle Program as a method to put small spacecraft into orbit with high reliability and low cost from launch facilities at Vandenberg AFB. The U.S. Air Force (Air Force) is the lead agency, and the Federal Aviation Administration (FAA) Office of Commercial Space Transportation is a cooperating agency, in supervising the preparation of the EA.

The Commercial Space Launch Act of 1984 (Public Law 98–575) encourages the use of government infrastructure and resources, currently underutilized, in an excess capacity situation to promote commercial investment and use of space. The Falcon Launch Vehicle Program would also meet the National Space Transportation Policy's goal to significantly reduce space transportation costs in order to make continued exploration, development, and use of space affordable.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES CONSIDERED

Space X proposes to operate its Falcon Launch Vehicle Program to provide commercial launch services at Space Launch Complex 3 West (SLC-3W) at Vandenberg AFB. Space X is developing the Falcon launch vehicle. The Falcon is a light-lift, two-stage vehicle that utilizes only liquid fuels. The Falcon Launch Vehicle Program is designed to require minimal time for vehicle assembly or payload processing on the launch pad. Much of the vehicle assembly would occur at the Space X facilities in El Segundo, California. A goal of the Falcon Vehicle Program is to launch within a few days to one week of payload arrival at the launch site.

A maximum of two to three launches would be conducted per year beginning with one to two in 2004, two to three in 2005, and three in 2006, after which continuation of the program would be reevaluated. No test flights are planned and all flights are expected to have payloads.

The Proposed Action is to launch the Falcon under the Falcon Launch Vehicle Program using a deluge water system for fire and noise suppression. Alternative 1 is to launch the Falcon vehicle without a deluge water system.

Under the No-Action Alternative, SLC-3W would remain undeveloped by Space X and the Falcon Launch Vehicle Program would disband and cease to exist. Space X would not use SLC-3W to meet the National Space Transportation Policy's goal of providing low-cost and reliable access to space. The Commercial Space Launch Act's goal to encourage the use of underutilized government infrastructure and resources to promote commercial investment and use of space would also not be realized at SLC-3W by Space X's usage.

3.0 ENVIRONMENTAL CONSEQUENCES

The EA presents the analysis and description of potential environmental impacts that could result from the Proposed Action and Alternatives. As appropriate, the affected environment and environmental consequences of the Proposed Action and Alternatives are presented in terms of regional and site-specific descriptions for the following resource areas: land use/visual resources, noise, biological resources, cultural resources, air quality, hazardous waste/hazardous materials, water resources, geology and soils, transportation, utilities, solid waste management, health and safety, socioeconomics, and environmental justice.

4.0 CONCLUSION

Based on a careful review of the analyses and data in the EA, no significant impact to the natural or human environment would be expected from implementing the Proposed Action. Because no impacts or less than significant impacts would occur to the resource areas analyzed, no mitigation measures are recommended. Therefore, issuance of a Finding of No Significant Impact is warranted, and preparation of an Environmental Impact Statement, pursuant to the National Environmental Policy Act of 1969 (Public Law 91-190) is not required.

DANIEL P. LEAF
Lt. General, USAF
Vice Commander HQ AFSPC

Date

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1.0 INTRODUCTION

1.0 INTRODUCTION

This Environmental Assessment (EA) evaluates the potential environmental impacts associated with implementing the proposed Falcon Launch Vehicle Program at Vandenberg Air Force Base (AFB), California (Figure 1-1). The Falcon Launch Vehicle Program is a commercial venture by Space Exploration Technologies, Inc. (Space X). The U.S. Air Force (Air Force) is the lead agency, and the Federal Aviation Administration (FAA) Office of Commercial Space Transportation is a cooperating agency, in supervising the preparation of this EA. Because Space X would use launch facilities at Vandenberg AFB for the Falcon Launch Vehicle Program, the Air Force would be the lead agency in supervising preparation of the EA.

Space X would also be applying for a launch license from the FAA for launches with commercial payloads. The Commercial Space Launch Act of 1984 (Public Law 98–575), as codified at 49 United States Code (U.S.C.) Subtitle IX, Ch. 701, Commercial Space Launch Activities, declares that the development of commercial launch vehicles and associated services is in the national economic interest of the United States. To ensure that launch services provided by private enterprises are consistent with national security and foreign policy interests of the United States and do not jeopardize public safety and safety of property, the Department of Transportation is authorized to regulate and license United States commercial launch activities. Within the Department, the Secretary of Transportation's authority under Commercial Space Launch Activities has been delegated to the FAA's Office of Commercial Space Transportation. Therefore, the Air Force has requested that the FAA be a cooperating agency in supervising the preparation of the EA.

In addition to the EA and determination, applicants for a launch license must complete a policy review and approval, safety review and approval, payload review and determination, and a financial responsibility determination. All of these reviews, including the EA, must be completed prior to receiving a launch license. All FAA safety analyses would be conducted separately and would be included in the terms and conditions of the license.

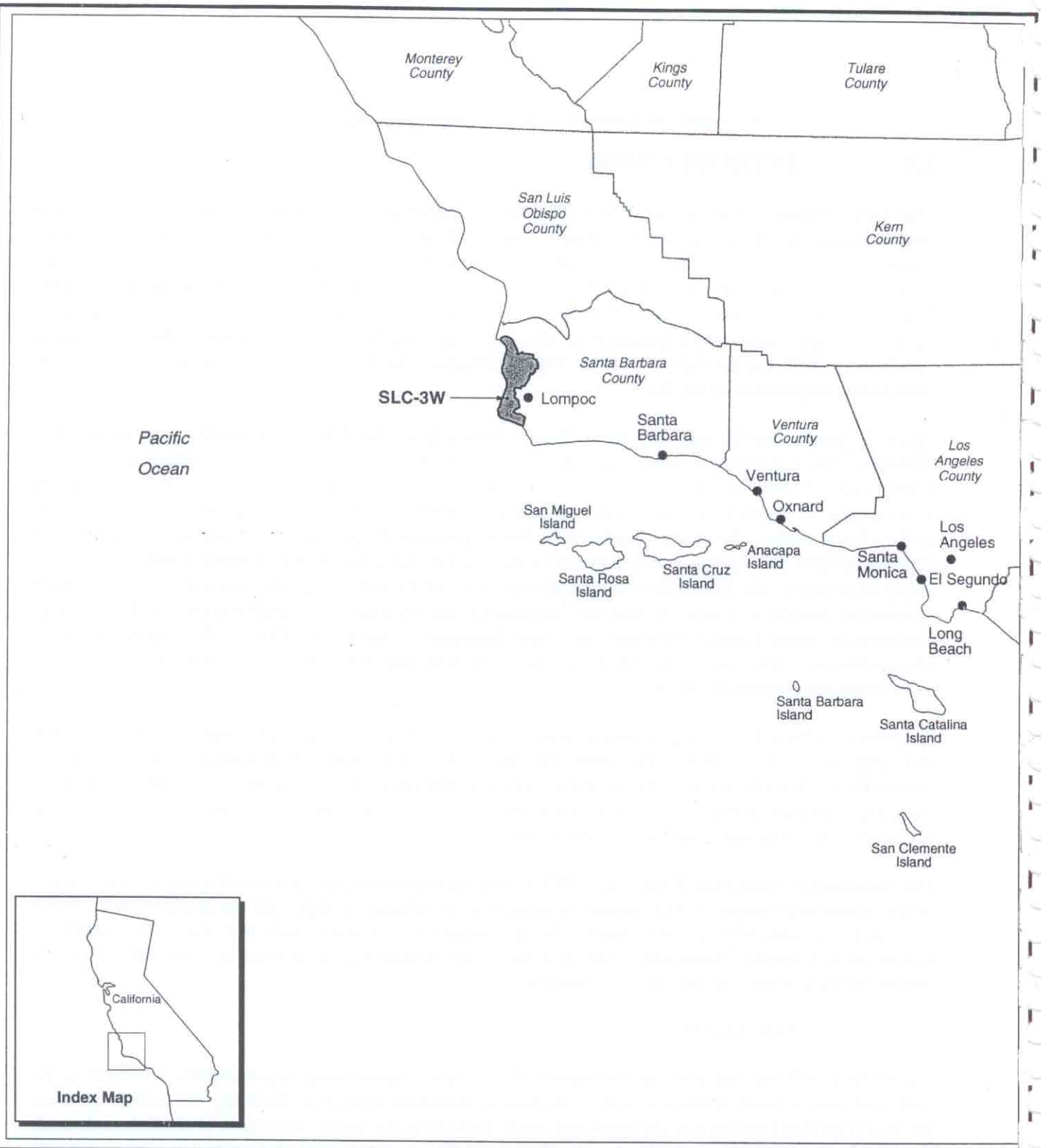
The National Environmental Policy Act (NEPA) and the implementing regulations issued by the Council on Environmental Quality (CEQ) require lead agencies to prepare or supervise the preparation of an EA for federal actions that do not qualify for a categorical exclusion and that may not require an Environmental Impact Statement. This EA has been prepared in conformance with NEPA and its implementing guidance in the federal regulations.

1.1 LOCATION

Vandenberg AFB encompasses approximately 99,100 acres, representing approximately 6 percent of the total land area of Santa Barbara County. The base is accessible from U.S. Highway 101, which connects the base with San Francisco to the north and Santa Barbara to the south. Operation of the Falcon Launch Vehicle Program would occur at the Vandenberg AFB launch facility designated as Space Launch Complex 3 West (SLC-3W) (Figure 1-2).

1.2 BACKGROUND

The Air Force provides support to the United States government and commercial entities for low-cost and reliable access to space. A tremendous amount of research is being focused on reducing today's high cost of space access while increasing its reliability and safety.



LEGEND

Vandenberg AFB

0 10 20 40 Miles

Source: Modified from U.S. Air Force 1998a.

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

GENERAL VICINITY MAP

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4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

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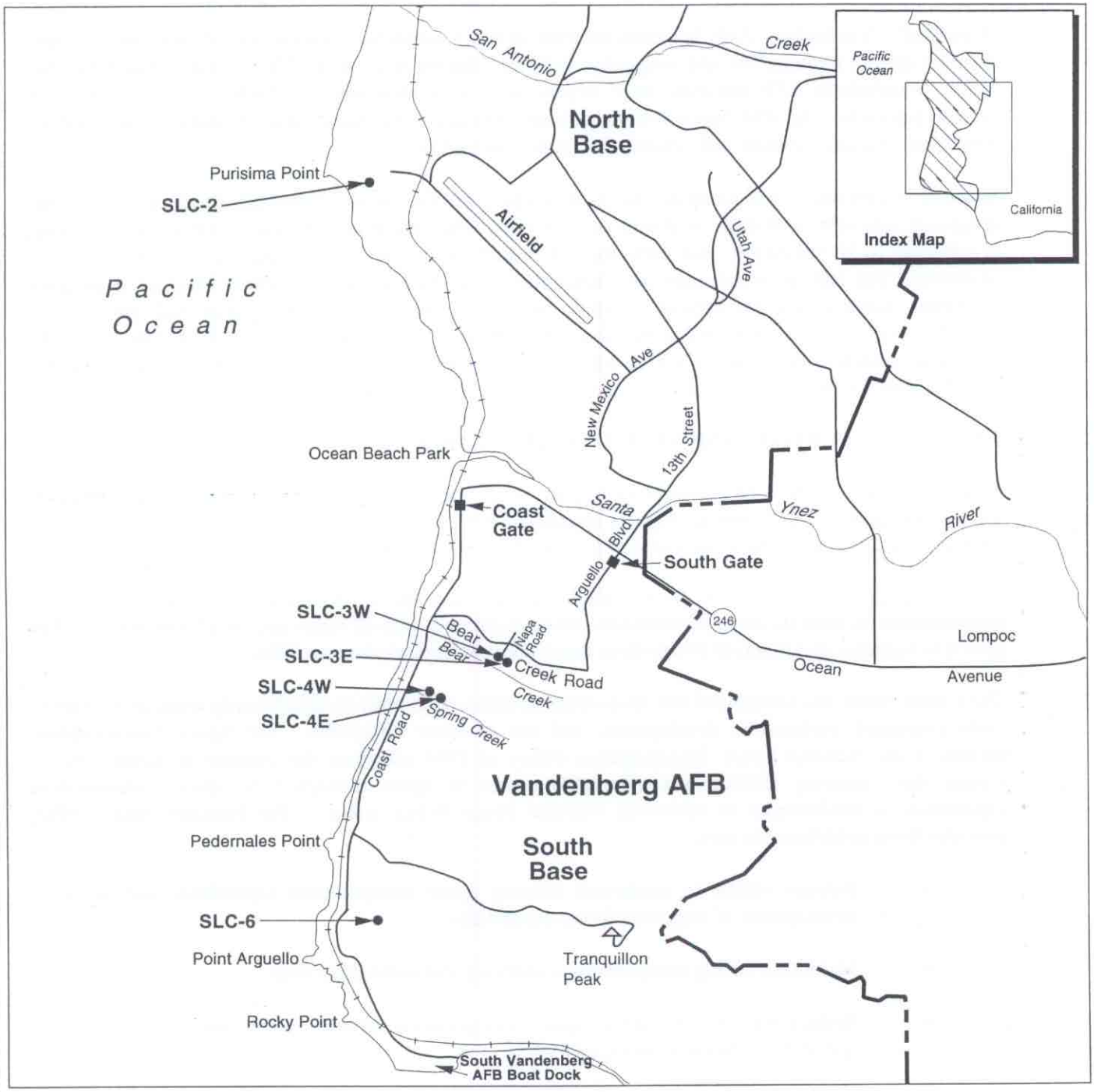
12958-03	2/21/03	RANDALL	EELV/077	g:/commercial/1295-03 XSPACE/1-1vicinity.ai	1-1



LEGEND

- Railroad
- Roads
- Base Boundary
- (246) State Route

0 .5 1 2 Miles

Source: Modified from U.S. Air Force 1998a.

UNITED STATES AIR FORCE
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PROJECT LOCATION MAP

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TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	2/6/03	RANDALL	EELV/022	g:/commercial/1295-03 XSPACE/1-2location.ai	1-2

Historically, Vandenberg AFB has been selected as the location for construction of facilities to launch several types of intermediate and long-range ballistic vehicles (e.g., Atlas, Thor, Titan). Since the mid-1950s, Vandenberg AFB missions have largely been associated with the launch of government and civilian payloads. The 30th Space Wing is currently the host wing, under Space Command and conducts west coast military, civilian, and commercial launch operations.

Space X is a privately held company that is developing the Falcon as a light-launch vehicle to put small spacecraft into orbit with high reliability and low cost. The Falcon is a two-stage vehicle; the first stage is intended to be recovered, and parts thereof reused, while the second stage is not intended to be recovered. The Falcon vehicle uses only liquid fuels. The Falcon Launch Vehicle Program is designed to require minimal time for vehicle assembly or payload processing on the launch pad; much of the assembly would be accomplished at the Space X facilities in El Segundo, California (Figure 1-1). The goal is to launch within a few days to one week of payload arrival at the launch site. This requires minimal time for processing the payload and minimal use of the launch pad.

1.3 PURPOSE AND NEED FOR THE ACTION

This document examines the potential for impacts to the environment from the proposed Falcon Launch Vehicle Program. The potential impacts associated with use of the launch vehicle and facilities are addressed in this EA and have been assessed using the most current information available.

Space X plans to use SLC-3W as its launch site on Vandenberg AFB and will complete necessary refurbishment to meet its own specifications, while complying with all range and base requirements. The goal is to launch a maximum of two to three times per year through the year 2006.

The United States has recognized that space transportation costs must be significantly reduced in order to make continued exploration, development, and use of space affordable. The Space Transportation section of the National Space Transportation Policy of 1994 addresses the commercial launch sector, stating that "assuring reliable and affordable access to space through U.S. space transportation capabilities is fundamental to achieving National Space Policy goals." The National Space Policy provides these guidelines (in part):

- Balance efforts to modernize existing space transportation capabilities and invest in development of improved future capabilities.
- Maintain a strong transportation capability and technology base.
- Reduce the cost of current space transportation systems while improving reliability, operability, responsiveness, and safety.
- Encourage, to the fullest extent feasible, the cost-effective use of commercially provided United States products and services.

The Proposed Action and similar endeavors are needed to fulfill the purpose of the National Space Transportation Policy to achieve affordable access to space. Space X, under full private funding, is building a launch vehicle intended to substantially reduce the cost of reliable American access to space. This goal may be met without compromising public safety, unduly interfering with commercial and private aircraft, or adversely affecting the environment. SLC-3W has been selected as the preferred alternative as it is the most favorable site due to its location (favorable for highly inclined orbital

insertion), its availability, and its history of substantial previous use as a launch site. The Commercial Space Launch Act also allows government infrastructure and resources currently underutilized to be used as excess capacity to promote commercial investment and use of space.

1.4 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

The NEPA established a national policy to protect the environment and ensure that federal agencies consider the environmental effects of actions in their decision making. The CEQ is authorized to oversee and recommend national policies to improve the quality of the environment. The CEQ published regulations that describe how NEPA should be implemented. These regulations encourage federal agencies to develop and implement procedures that address the NEPA process in order to avoid or minimize adverse effects on the environment. Title 32 of the Code of Federal Regulations (CFR) Part 989 addresses implementation of NEPA as part of the Air Force planning, supervision, and decision making process.

1.5 FUTURE USE OF THIS DOCUMENT

Future proposed projects would be reviewed and evaluated to determine if they fall within the scope of this EA. In some cases, a supplement to this EA may be required. If a Supplemental EA is required, a new Finding of No Significant Impact (FONSI) would be necessary prior to committing Federal resources. Future actions that are found to result in significant impact to the environment that could not be mitigated to a level of insignificance would need to be addressed in an Environmental Impact Statement.

Space X is considering the use of a second vehicle for the Falcon Launch Vehicle Program, the Tri-Falcon launch vehicle. Tri-Falcon is a medium-lift vehicle consisting of three Falcon first stages mounted in parallel, with the second stage on top of the center first stage. The Tri-Falcon specifications for the first stages and second stage are identical to the Falcon, the main difference between the Falcon and the Tri-Falcon is vehicle weight and gross lift-off weight. A Supplemental EA would be prepared for any future proposed launches of the Tri-Falcon, however, the number of launches per year for the program would not change.

The FAA, which is a cooperating agency for this EA, will also rely on this analysis to support its environmental determination for a launch license for Space X for the Falcon Launch Vehicle Program. At the conclusion of this environmental review process, the FAA will issue a separate environmental decision to support its licensing determination. The FAA will draw its own conclusions from the analysis presented in this EA and assume responsibility for its environmental decision and any related mitigation measures. In order for the FAA to use this analysis to support its determination, the EA must meet the requirements of FAA Order 1050.1 D, *Policies and Procedures for Considering Environmental Impacts*, which describes the Agency's procedures for implementing NEPA.

1.6 STRUCTURE OF THIS EA

This EA presents the analysis and description of potential environmental impacts that could result from the Proposed Action and Alternatives. As appropriate, the affected environment and environmental consequences of the Proposed Action and Alternatives are presented by regional and site-specific descriptions.

Chapter 2.0 contains descriptions of the Proposed Action and the general parameters associated with the Proposed Action. It also describes Alternative 1 and the No-Action Alternative.

Chapter 3.0 provides regional and site-specific information related to land use/visual resources, noise, biological resources, cultural resources, air quality, hazardous waste/hazardous materials, water resources, geology and soils, transportation, utilities, solid waste management, health and safety, socioeconomics, and environmental justice. The regional information included in this section provides the background for understanding the context of the site-specific information that could affect or be affected by the Proposed Action and Alternatives.

Chapter 4.0 addresses the potential effects of the Proposed Action and Alternatives on the resource areas analyzed and addresses potential cumulative impacts. As appropriate, the effects are presented in terms of whether they are operation- or construction-related.

Chapter 5.0 presents a list of all applicable environmental requirements relating to the Proposed Action or Alternatives.

Chapters 6.0 through 9.0 identify references, persons and agencies contacted, preparers of this EA, and acronyms and abbreviations, respectively.

A letter of cooperation between the FAA and the Air Force in the preparation of this EA is provided in Appendix A. A mailing list for the EA is in Appendix B. An air quality analysis is provided in Appendix C, and the results of engine noise modeling and sonic boom noise modeling for the Falcon Launch Vehicle Program are provided in Appendices D and E, respectively.

1.7 REGULATORY COORDINATION

The following regulatory coordination, approval, and permits, other than with the Air Force and FAA, would be required for the proposed project:

- Coordinate with the California Coastal Commission to obtain a Coastal Consistency Certification.
- Coordinate with the U.S. Fish and Wildlife Service for Section 7 consultation pursuant to the federal Endangered Species Act (ESA).
- Coordinate with National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly National Marine Fisheries Service) to be included on the Letter of Authorization and Incidental Take Permit for Harassment of Marine Mammals at Vandenberg AFB.
- Conduct informal consultation with NOAA's Channel Islands National Marine Sanctuary staff and the National Park Service's Channel Islands National Park staff for proposed overflights over the Channel Islands and Sanctuary.
- Coordinate consultation between the Air Force and the Tribal Elders at the Santa Ynez Band of Chumash Indians regarding use of SLC-3W.

- Submit a Notice of Intent (NOI) and prepare a Storm Water Pollution Prevention Plan (SWPPP) for a General National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges Associated with Construction Activities from the Central Coast Regional Water Quality Control Board since the proposed construction activity would involve the disturbance of more than 1 acre.

- Submit a California Business Plan to the County of Santa Barbara Fire Department for the storage of liquid oxygen (LOX), rocket propellant 1 (RP-1), liquid nitrogen, and gaseous helium.

- Prepare a Spill Prevention, Control, and Countermeasures (SPCC) Plan pursuant to state and Federal regulations for the aboveground storage tanks (ASTs) for LOX, RP-1, liquid nitrogen, and gaseous helium.

- Register the AST for RP-1 with the State Water Resources Control Board.

- Obtain an Authority to Construct and Permit to Operate from the Santa Barbara County Air Pollution Control District for all applicable stationary and portable source equipment, painting activities, and solvent wipe and flush operations.

- Obtain air permit(s) from the appropriate Air Pollution Control District(s) to operate the salvage ship in California coastal waters.

- Obtain a unique U.S. Environmental Protection Agency (U.S. EPA) identification number for generating hazardous waste.

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action, Alternative 1, and the No-Action Alternative. Alternatives considered but eliminated from further study are also briefly described.

2.1 PROPOSED ACTION

Space X proposes to operate its Falcon Launch Vehicle Program to provide commercial space operations from SLC-3W at Vandenberg AFB. The Proposed Action is to launch a new space launch vehicle, the Falcon. Two to three launches would be conducted per year beginning with one in 2003, one to two in 2004, two to three in 2005, and three per year through 2006. No test flights are planned and all flights are expected to have payloads.

The Falcon, a light-lift launch vehicle, is a two-stage vehicle designed to put small spacecraft into orbit with high reliability and low cost. The first stage will be recoverable and the second stage will not be recoverable. The Falcon uses only liquid propellants (LOX and RP-1); no solid fuels or propellants are used.

The Falcon Launch Vehicle Program is designed for minimal vehicle assembly or processing on the launch pad, with most of the vehicle assembly taking place at the Space X facilities in El Segundo, California (see Figure 1-1). Non-hazardous payloads would be processed at SLC-3W and hazardous payloads would be processed at one of the existing payload processing facilities on Vandenberg AFB. The goal is to launch within a few days to one week of payload arrival at the launch site.

Lockheed Martin Corporation, the former site operator, decommissioned the SLC-3W facility in 1998. Therefore, Space X would need to reinstall utilities (e.g., communications, water, electricity) and conduct limited refurbishment of the existing building to bring SLC-3W back into operation as a launch facility for the Falcon Launch Vehicle Program.

Refurbishment at SLC-3W and operation of the Falcon Launch Vehicle Program would comply with all FAA, and other federal, state, and local, regulations and requirements, and Air Force requirements contained in the *Commercial Space Operations Support Agreement (CSOSA) (main document plus Annex B) for the Falcon Launch Vehicle Program Between the United States Air Force Space Command and the 30th Space Wing, Vandenberg Air Force Base, California and Space Exploration Technologies Corporation* (U.S. Air Force 2002a) and Eastern and Western Range (EWR) 127-1, Range Safety Requirements, Chapter 5, *Facilities and Structures Documentation, Design, Construction, Test, and Inspection Requirements*.

Further details on the operation and construction phases of the proposed Falcon Launch Vehicle Program are provided in Sections 2.1.1 and 2.1.2, respectively.

2.1.1 Operation Phase

2.1.1.1 Launch Vehicle

The Falcon is a small, unmanned light-lift, two-stage, liquid fueled vehicle with a gross lift-off weight of 49,000 pounds that can carry payloads between 275 and 840 pounds depending upon the orbit. At 68 feet in length with a diameter of 66 inches, tapering to 60 inches on the second stage, the Falcon is much

smaller than many other space launch vehicles launched from Vandenberg AFB, such as the Atlas IIAS (see configuration and comparison in Figure 2-1), which launched from SLC-3W and the adjacent pad at SLC-3E.

Both the first and second stages use only liquid propellants (LOX and RP-1). The first stage uses a turbo pump to feed the propellant, while the second stage is pressure-fed using gaseous helium as a pressurant. Propellant use (in gallons) and specifications for each stage are as follows.

First Stage. The first stage consists of aluminum LOX and RP-1 tanks with a common bulkhead powered by a 70,000-pound thrust Merlin LOX/RP-1 engine with Pintle injector, a pump-fed gas generator cycle, turbine exhaust roll control, and hydraulic thrust vector control. The propellant tanks hold 3,357 gallons (34,362 pounds) of LOX and 2,178 gallons (15,782 pounds) of RP-1.

A computer on the first stage controls engine startup; monitors the gas generator, turbo pump, and main engine parameters; controls the two servo valves of the gimbal system; and collects a portion of the telemetry in the engine bay. This computer is connected to the flight computer in the second stage avionics bay with an Ethernet local area network.

Second Stage. The second stage consists of aluminum-lithium LOX and RP-1 tanks with a common bulkhead, and uses helium as a pressurant. The engine is a 7,500-pound thrust Kestrel engine with Pintle injector, hot helium attitude control, and an electromagnetic actuator for thrust vector control.

The propellant tanks hold 582 gallons (5,941 pounds) of LOX and 350 gallons (2,517 pounds) of RP-1.

The avionics include a redundant, ruggedized flight computer and inertial measurement unit (IMU). The flight computer is a PC/104-based computer with analog and digital input and output and provides an interface to the payload via Ethernet, an innovation for launch vehicles. A global positioning system (GPS) receiver provides navigational information and allows compensation for wind drift. The avionics system also includes an S-band telemetry system, a video downlink, and a C-band transponder.

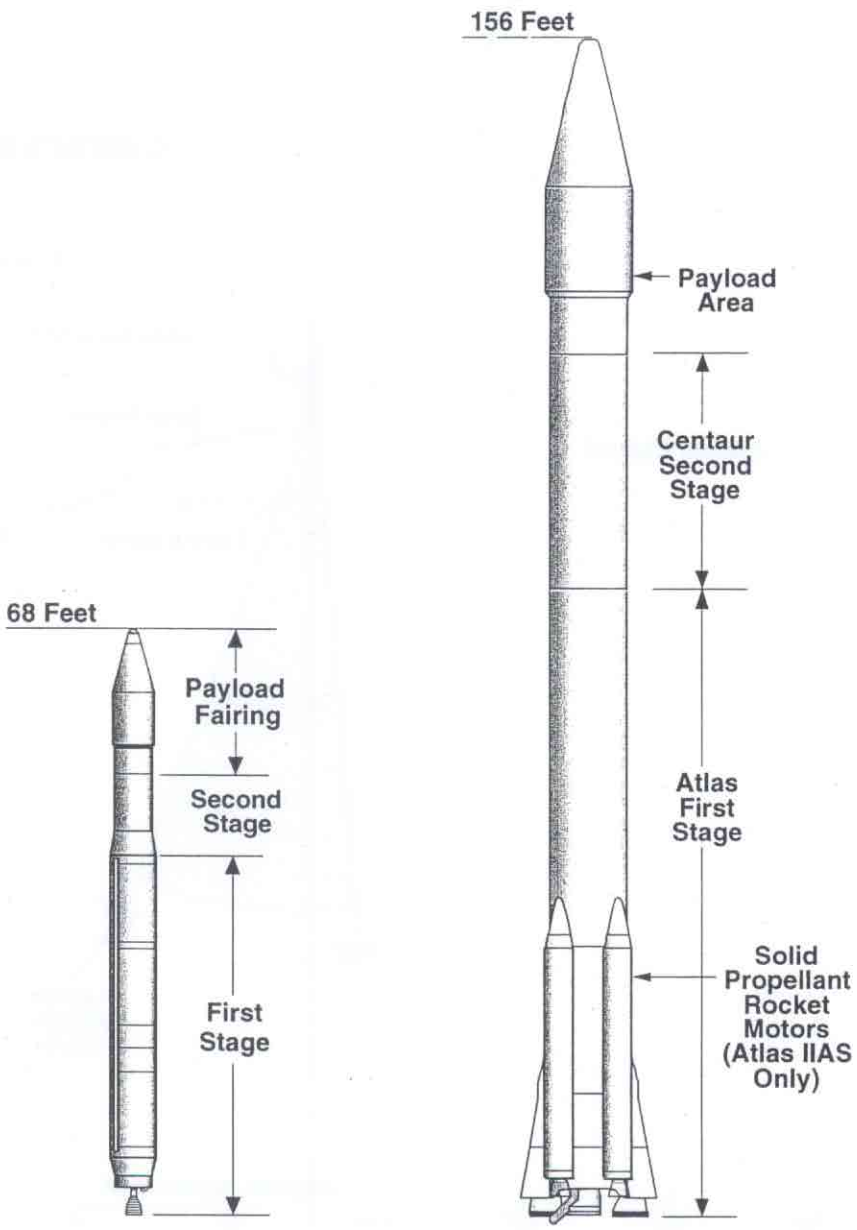
The second stage contains the flight termination system (FTS) with a heritage design that includes redundant batteries, command receivers, and safe and arm systems. The FTS will be installed by Space X and operated/controlled by the Vandenberg AFB Flight Safety Officer.

2.1.1.2 Launch Trajectory

The proposed launch site, SLC-3W, is currently approved for the Atlas IIAS in a range of azimuths from 155 degrees to 193 degrees. Early Falcon launch trajectories would be within 160 to 190 degrees to ensure the nominal ground trace is west of Santa Rosa Island and east of oil platforms (Figure 2-2).

2.1.1.3 Frequency of Launches

Two to three launches would be conducted per year beginning with one in 2003, one to two in 2004, two to three in 2005, and three per year through 2006. No test flights are planned and all flights are expected to have payloads. Current demand for a light-lift vehicle is approximately one to two launched worldwide. Planning for 2 to 3 launches per year from Vandenberg AFB provides a substantial margin.



Note: Heights shown represent maximum vehicle height.

Source: Modified from U.S. Air Force 1998a.

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

FALCON VEHICLE CONFIGURATION

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4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

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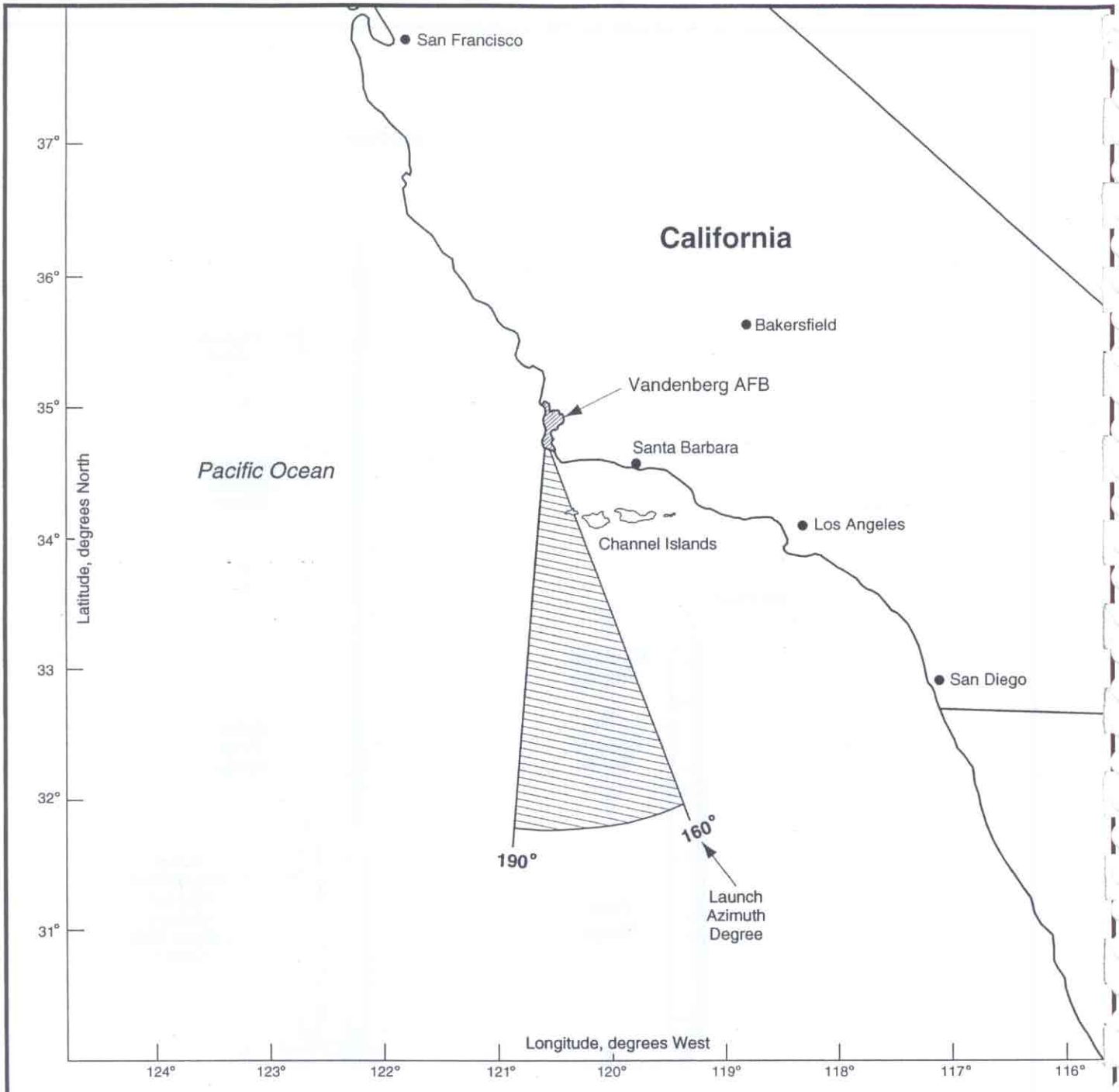

LEGEND

Range of potential launch azimuths

Azimuth - The compass direction along which the launch vehicle's ground track lies in its early flight

0 20 40 80 Miles

Source: Modified from U.S. Air Force 1998a.

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POTENTIAL LAUNCH AZIMUTHS

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Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE N
12958-04	5/21/03	RANDALL	EELV/091	g:/commercial/1295-03 XSPACE/2-2azimuths.ai	2-2

2.1.1.4 Payloads

Payloads for the Falcon are small, would vary in mission, but would largely be research payloads provided by academic, or government and some commercial customers. Payloads would mostly consist of non-hazardous materials; however, some payloads may contain hypergolic propellants such as hydrazine and nitrogen tetroxide, or minute levels of ionizing radiation sometimes present in scientific instruments.

2.1.1.5 Launch Site Operations

The Falcon would be integrated as three primary assemblies: the first stage assembly, the second stage assembly, and the payload assembly. The first and second stage assemblies would be processed horizontally at the Space X facility in El Segundo, California (see Figure 1-2), and then subsequently shipped, horizontally and separately, to the launch facility at SLC-3W (Figure 2-3).

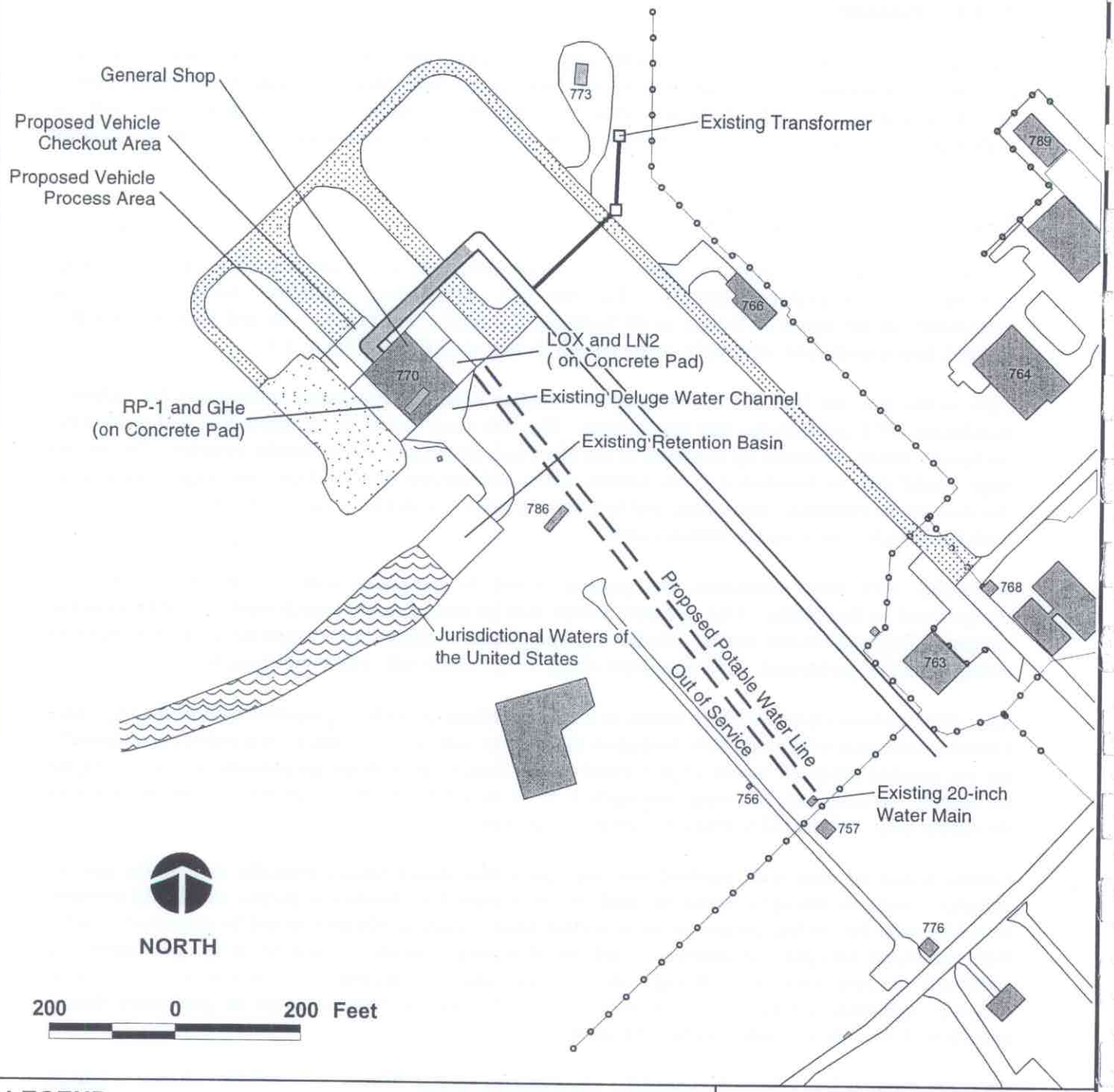
Once at the site, the first and second stage assemblies would be processed horizontally for ordnance installation, FTS connections, and system tests. The first stage would be transferred to, and erected on, the launch mount, followed by checkout of the electrical, pneumatic and hydraulic systems. The second stage would then be transferred to the launch mount and erected on top of the first stage, followed by checkout of the electrical, pneumatic, and hydraulic systems. A mobile crane would be used to erect and stack the launch vehicle on the launch mount.

In parallel with these operations, the payload would be integrated with the payload adapter and encapsulated in the fairing. This assembly would then be moved to the launch stack and lifted onto the integrated first and second stages. Mechanical and electrical connections would be made and interface testing would be performed. A final systems check would verify full vehicle functionality.

After final systems checkout, there would be a mission rehearsal without propellants on board (dry) plus a mission rehearsal with propellants loaded on the vehicle (wet) to verify full launch readiness. Normally, the wet mission rehearsal would be performed on the launch day with the propellants on board used for the launch. If necessary for some contingency, RP-1 would be off-loaded through a drain sequence to the supply tank, and the LOX would be vented to atmosphere.

Fueling would be done with standard zero-leak quick disconnect fittings typically used in the aircraft industry. Gaseous nitrogen would be used on the system for cleanliness purges and liquid nitrogen would be used for cooling purges on an as-needed basis. Gaseous nitrogen would be generated directly from the liquid nitrogen. In addition, 5 gallons of isopropyl alcohol would be on-site per launch for additional cleaning operations; though only one-half gallon is estimated to be required for various cleaning operations during the launch preparation. No solvent flushes would be performed during operation of the Falcon Launch Vehicle Program.

On a per-mission basis, launch campaigns are expected to last from 4 to 8 weeks. During a launch campaign, an average of 10 to 12 Space X employees—with a peak of 25 personnel for about one week—would be present at SLC-3W. Ground transportation support during a launch campaign would be minimal, consisting of a fuel truck; LOX truck; nitrogen truck; helium truck; a truck to deliver a crane; three delivery trucks for the first stage, second stage, and payload; a pump truck for deluge water disposal (see Section 2.1.1.6); and a pump truck for domestic wastewater disposal (see Section 2.1.2.1). Space X would contract or perform in-house removal of solid waste to an off-base recycling or disposal facility as well. Between launch campaigns, 3 employees would be present at the site. Personal vehicles



LEGEND

- Fence
- Street
- Building
- Proposed Asphalt Road
- Proposed Parking Area with Road Base
- Jurisdictional Waters of the United States
- Proposed Underground Communication Lines
- Existing Aboveground Cable Tray for Communication Lines
- Proposed Potable Water Line
- Proposed Underground Electrical
- RP-1 Rocket Propellant-1
- GHe Gaseous Helium
- LOX Liquid Oxygen
- LN2 Liquid Nitrogen

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

SITE PLAN MAP OF SLC-3W FACILITIES

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12958-04	5/21/03	RANDALL	VAFB GIS	Graphics:/Commercial/12958-03 SPACE-X/2-3 SitePlan.ai	2-3

would be used to commute on- and off-site and the pump truck would be used once a week to transport domestic wastewater off-site for disposal.

2.1.1.6 Primary Support Structures of Launch Vehicles

Unloading, Storage, Vehicle and Payload Processing, and Assembly Facilities

The Space X facilities in El Segundo, California, would serve as the primary storage, vehicle processing, and assembly facilities for the Falcon.

At SLC-3W, a vehicle processing area and vehicle checkout area would be established on the southwest corner of Building 770 (Figure 2-3). This area would be used for all unloading, storage, and any payload processing that would take place at the launch facility. The site plan would be reviewed by the 30th Space Wing Range Safety office (Range Safety) to ensure proper placement of storage and processing areas.

Non-hazardous payloads would be processed at SLC-3W and hazardous payloads would be processed at approved payload facilities such as Spaceport Systems International or Astrotech Space Operations on Vandenberg AFB, or in other commercial or academic facilities off-base. Approved safety procedures for hazardous payloads would be in place at SLC-3W (see Safety Systems).

Launch Pad

The launch platform would be the simple concrete pad over the flame bucket that currently exists at Building 770 with a launch mount and surround upper deck. The launch mount and upper deck would be sandblasted and repainted after each launch. A 60-foot stainless steel umbilical tower would be needed to facilitate the limited integration and payload processing that is required once the vehicle is stacked, and would provide electrical and data service to the launch vehicle. At launch, the umbilical tower would fall away from the vehicle into the flame bucket. The umbilical tower would be painted initially and again between launches to prevent corrosion of the structure. No abrasive blasting of the umbilical tower would be necessary however, to remove old paint. The umbilical tower would either remain in the flame bucket between launches or be moved into Building 770 and erected onto the concrete pad before each launch.

Launch Control Support

The Facility 475, South Vandenberg AFB Communications Center, Room 125, would be used as technical support space for launch operations. In addition, the Mobile Launch Control Center is planned to be located outside of Facility 475 during launch operations. Facility 763, SLC-3 Launch Operations Building, Room 105, may be possibly used in the future as a Command and Control facility for pre-launch and launch operations. Office space and a general shop area would be established in Building 770 (Figure 2-3).

Small volumes (less than 1 gallon) of heavy gear oil with kerosene and cutting oil (less than 1 gallon), and a tube of adhesives would be stored in the shop area in Building 770 for general use. An oxygen/acetylene torch with its associated gases (carbon dioxide and argon gases) may also be used in Building 770 on a limited basis.

Propellant and Gas Holding Areas

Building 770 would separate—and provide a safety barrier between—the LOX and RP-1 storage and servicing areas as depicted on Figure 2-3. LOX would be stored in a 13,000-gallon aboveground storage tank (AST) on a concrete pad located to the north of Building 770. Liquid nitrogen would be stored in a 6,000-gallon AST adjacent to the LOX tank. RP-1 would be stored in a 6,000-gallon AST located on a concrete pad located to the south of Building 770. Gaseous helium would be delivered and stored on a trailer tube-bank located adjacent to the RP-1 tank. The storage locations for all Falcon Launch Vehicle Program liquid propellants and gases would correspond to the locations previously used for the Atlas program, thereby affording the same level of separation and protection.

Safety Systems

Specific safety plans would be developed for the Falcon Launch Vehicle Program to ensure that each launch operation was in compliance with applicable regulations, as specified in numerous compliance documents, and by various organizations, including:

- EWR 127-1, *Range Safety Requirements*;
- Air Force Manual (AFMAN) 91-201, *Explosive Safety Standards* (per EWR 127-1);
- DoD Standard 6055.9, *Ammunition and Explosives Safety Standards* (per EWR 127-1);
- Space Wing Instruction (SWI) 32-102, *Fire Prevention*;
- Air Force Instruction (AFI) 91-110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems*; Supplement 1 to AFI 91-110, AFI 40-201, Managing Radioactive Material in the U.S. Air Force; and SWI 40-101, *Managing Radioactive Material on Vandenberg AFB* (for minute amounts of radioactive materials typical of scientific equipment potentially present in payloads);
- SWI 31-101, *Installation Security Instruction*; AFI 31-101, *Air Force Installation Security Program*; and DoD 5220.22-M, *National Industrial Security Program Operating Manual*;
- AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*;
- Air Force Occupational Safety and Health Standards;
- National Fire Protection Association, National Fire Codes;
- American National Standards Institute; and
- Occupational Safety and Health Administration (OSHA).

Eastern and Western Range 127-1 defines overall safety regulations for Vandenberg AFB. This document is tailored for each launch program. All tailoring is performed with the range safety organizations and is approved by the safety organizations. The objective of the range safety program is

to ensure that the general public, launch area personnel, foreign land masses, and launch area resources are afforded an acceptable level of safety, and that all aspects of pre-launch and launch operations adhere to public law. EWR 127-1 provides a framework for review and approval of all hazards associated with construction, pre-launch, and launch operations, and incorporates all Air Force, DoD, and other applicable health and safety standards.

Range Safety and base Civil Engineering at Vandenberg AFB would review and approve the design and construction for refurbishment of the SLC-3W facility according to Section 5.2 of EWR 127-1 and AFMAN 91-201 to evaluate evacuation plans, AST locations, drain systems, the placement of storage and processing areas, and planned ground operations to establish safety clearance zones and safe operations at the launch pad. Additional details on the requirements for a fire protection system, security, seismic design, launch hazard area safety, mission/vehicle reliability, and quantity-distance criteria are provided in Section 3.13, Health and Safety.

In addition to satisfying all of the requirements listed above, Space X would install a deluge water system at SLC-3W primarily for noise and vibration suppression and secondarily for fire protection. Deluge water systems are used widely throughout Vandenberg AFB (at SLC-3E, SLC-6, and SLC-2) for this purpose; those systems normally discharge approximately 30,000 to 40,000 gallons per test/launch. For the Falcon, a pre-launch test of the deluge system would discharge approximately 4,000 gallons (2 minutes at 2,000 gallons/minute), and the launch suppression operation would discharge approximately 6,000 gallons (3 minutes at 2,000 gallons/minute) per launch. During launch, about 2,000 of the 6,000 gallons of deluge water would evaporate in the form of steam; the remaining 8,000 gallons of combined test and launch deluge water would be contained in the retention basin, analyzed, pumped out, and disposed of off-base at an approved industrial wastewater facility (see Section 3.7, Water Resources). The ground cloud formed by the steam would not contain any hazardous materials.

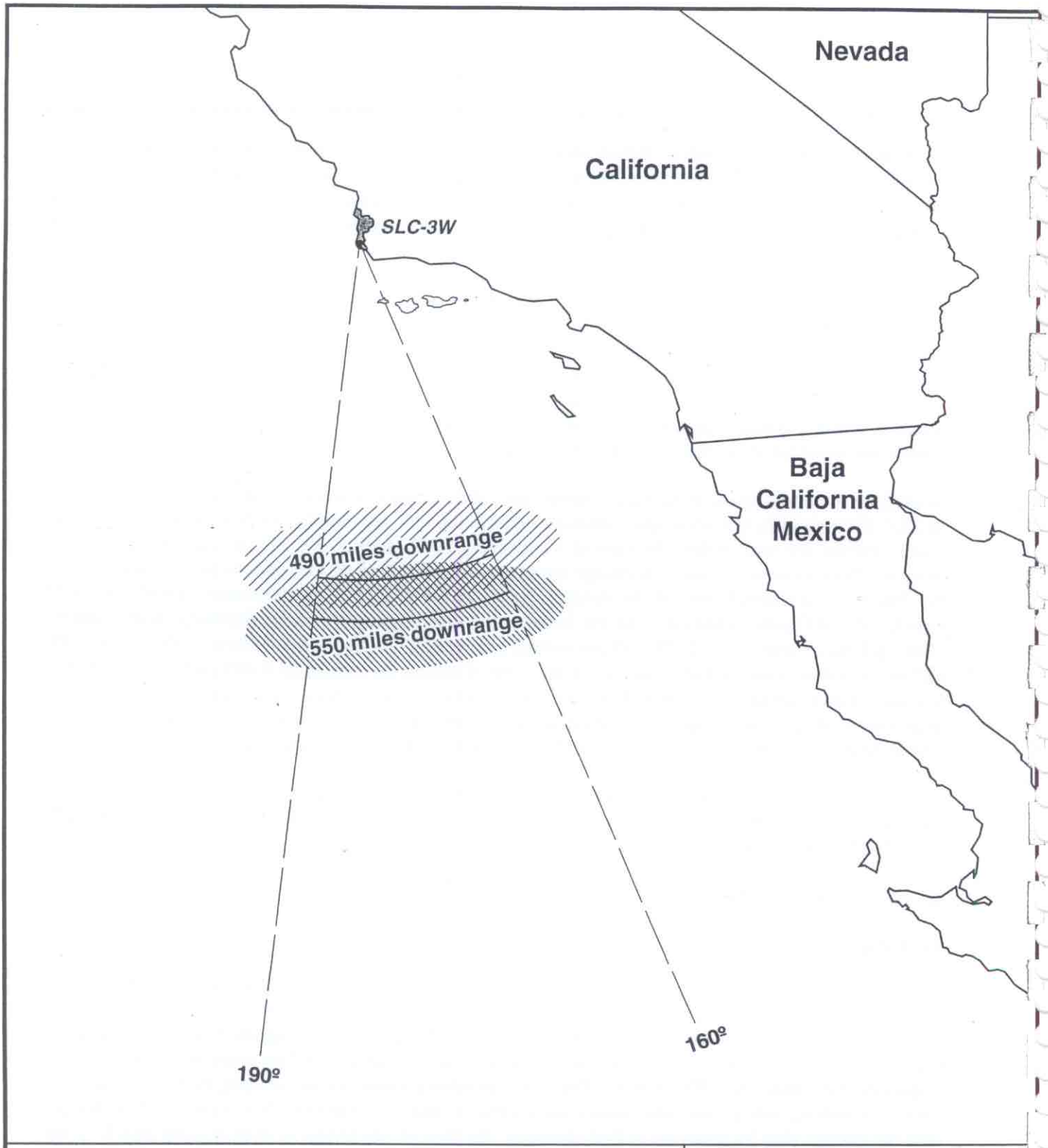
Finally, the security system at SLC-3W would be refurbished according to Air Force requirements specified in the CSOSA (U.S. Air Force 2002a) and contained in SWI 31-101, AFI 31-101, and DoD 5220.22-M (see Section 2.1.2.1).

2.1.1.7 Recovery Efforts

First Stage

The first stage would drop by parachute approximately 490 nautical miles downrange into the Pacific Ocean (Figure 2-4), well beyond the Channel Islands in an area west of Mexico, and be recovered by a salvage ship that, during a launch, would be stationed in a Range Safety–designated safety zone near the anticipated area of impact. The salvage ship would be able to locate the first stage by homing in on a responder that signals the GPS location. Recovery operations would consist of using divers to inspect the vehicle, installing safing pins, and connecting a cable so that the expended first stage could be hoisted onto the salvage ship for transport to Port Hueneme, the Port of San Diego, or Port of Long Beach. If the expended first stage could not be located it would likely be because it had been damaged. It would subsequently sink and therefore, it would not be recovered.

Although the propellants would be burned to depletion during flight, there is a potential for approximately 8 gallons of LOX and 5 gallons of RP-1 to remain in the expended Falcon first stage. These chemicals would be released into the ocean on impact. The LOX residue would dissipate as gaseous oxygen while the RP-1 residue would likely float on the surface of the ocean and dissipate within hours.



LEGEND

- Vandenberg AFB
- Impact Area for First Stage
- Impact Area for Fairing

0 25 50 100 Miles

Source: Modified from U.S. Air Force 1998a.

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

IMPACT AREA FOR
FIRST STAGE AND FAIRING

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE N
12958-04	5/21/03	RANDALL	EELV/077	g:/commercial/1295-03 XSPACE/2-4ImpactArea.ai	2-4

The recovered first stage would be returned to the Space X facilities in El Segundo via truck from port. Although portions of the recovered first stage would be reconditioned and reused if possible, such reuse is not an objective of its recovery; the probability of recovery based on sea-state or other factors is not launch critical. The recovered first stage would also be used as a source of information for continuous program improvement.

Second Stage

The second stage would burn up upon reentry into the atmosphere.

Fairing

The payload fairing would drop approximately 550 nautical miles downrange into the Pacific Ocean off the coast of Mexico (Figure 2-4). It would not be recovered as it is expected to be severely damaged on impact and sink.

Debris Analysis

As part of the safety review process, a Falcon debris model has been generated. The debris model identifies how many pieces the Falcon would breakup into if the vehicle were to fail, and the size and velocity of each piece, in order to establish debris corridors for the vehicle (see Section 3.12, Health and Safety). The reliability of the Falcon vehicle, however, would be at least 95 percent (or a 5 percent chance of a breakup). Therefore, the probability of vehicle failure is minimal.

2.1.1.8 Wildlife Monitoring and Impact Avoidance

The following measures, including monitoring of noise levels and wildlife responses to launches, would be conducted for the Falcon Launch Vehicle Program to ensure that the program would not adversely affect sensitive species.

1. Pre- and post-launch monitoring will be conducted of the beach layia population along Coast Road to determine the status of the population.

2. Southwestern willow flycatchers would be monitored at the Santa Ynez River and waterfowl ponds to determine the status of the population (if present). Surveys would be conducted before each launch, and if these birds are present, during the launch for daylight launches, and following each launch during the nesting season (May 15—August 15). If birds are present, acoustic measurements would also be collected at their locations during the launch.

3. Western snowy plovers would be monitored at Surf/Wall Beach to determine status. Pre- and post-launch monitoring would be conducted for launches during the nesting season (March 1—September 30), including the success of nests that may have been affected by launches. For daylight launches, monitoring of the species and acoustic measurements during the launch would be conducted if possible (depending on the extent of the impact line). In addition, during the non-breeding season, wintering plovers would be monitored to determine the effectiveness of minimization measures and to identify any impacts not previously considered.

4. California red-legged frogs would be monitored at Bear Creek and vicinity (including Bear Creek Pond) to determine status. Pre- and post-launch monitoring for California red-legged frogs and water quality would be conducted for all launches.

5. California least terns at the Santa Ynez River (if present) and Purisima Point would be monitored for status determination. They would also be monitored for pre-launch, during-launch (for daylight launches), and post-launch effects. Acoustic measurements at the Santa Ynez River (if present) and Purisima Point would also be collected during the launch.

6. Brown pelicans would be monitored for pre- and post-launch behavior. Visual monitoring of California brown pelicans would be conducted from Point Arguello, Rocky Point, and Point Pedernales. Pre- and post-launch surveys for both day and evening launches would be conducted to gather information on the numbers of California brown pelicans using the roosts during the time associated with the launch and to monitor behavior after the launch. Acoustic measurements would be collected at Point Arguello, Rocky Point, and Point Pedernales during the launch as well.

7. Avoid, whenever possible, launches that would produce a sonic boom over the Northern Channel Islands during peak pinniped pupping seasons, between April through June.

8. Give preference for launches after July 1 and prior to December 1.

9. Observations on harbor seal and other pinniped activity at the nearest occupied haulout(s) in the vicinity of the appropriate launch platform, would commence at least 72 hours prior to any planned launch occurring during the harbor seal pupping season (1 March through 30 June) and continue for a period of time not less than 48 hours subsequent to launching.

10. Observations conducted under condition 9 would be supplemented by video recording of mother-pup seal responses to launches during the pupping season.

11. For any space vehicle launch conducted during pinniped seasons, monitoring at the nearest Vandenberg AFB haulouts would be continued for a minimum of 4 censuses over a 2-week period following the launch.

12. Acoustic measurements would be conducted at nearby seal haulouts of the first launch of any launch vehicle not previously measured and reported to NOAA Fisheries. These measurements must be sufficient to predict the received sound pressure level of launch noise on all pinniped haulouts on Vandenberg AFB.

13. For each specific launch azimuth and trajectory, predictions will be made to determine the location of a sonic boom in the vicinity of the Northern Channel Islands. Those pinniped populations predicted to be subject to a sonic boom greater than 1 pound per square foot will be monitored for the impacts on seals and sea lions due to the sonic boom.

2.1.2 Refurbishment Phase

2.1.2.1 Modification of Existing Facilities

Space X proposes to make minimal modifications to the existing SLC-3W site, such as building improvements, propellant tank installation, re-installation of utilities and resurfacing of the launch water deluge drainage and retention basin, resurfacing of the entrance road, and installation of security measures (Figure 2-3). All modifications would take place within the existing, previously disturbed area of SLC-3W. Approximately 1.4 acres of ground disturbance would occur with refurbishment of the existing facilities, including resurfacing the retention basin and roads.

Facility

Modifications to Building 770 would consist of repainting; replacing doors and windows; installing wiring for lighting, data, and phones; re-installing plumbing (supply and drains); installing heaters and air conditioning; and installing carpet. A simple launch frame structure would be established on the existing launch pad by installing an umbilical tower over the existing flame bucket. Security measures, such as installation of cameras, will be implemented according to AFI 31-101, SWI 31-101, and DoD 5220.22-M, however, perimeter fencing would not be installed initially but may be considered depending upon future customer requirements. If required, a Supplemental EA would be prepared for construction of the fencing.

Building 770 still contains lead-based paint that was left on the building after Lockheed Martin Corporation decommissioned the facility in 1998. Testing for lead-based paint will be conducted prior to construction to determine its extent in the building and to determine the proper procedures for encapsulation or removal and disposal. All lead-based paint would be mitigated prior to construction.

A concrete slab would be re-poured on the southwest corner of Building 770 for the vehicle processing and checkout area and small pads would be installed to support the LOX and RP-1 tanks and to park the helium and nitrogen trailers (see Figure 2-3). Finally, lines and pumps would be installed at the launch pad for loading fuel, oxidizer, helium, nitrogen, and deluge water and fire suppression systems.

Infrastructure

Power, communications, and potable water connections would all need to be reinstalled at SLC-3W using existing connection locations (Figure 2-3). Underground utilities would be reinstalled within previously trenched areas.

Power from an existing 12 kilovolt (kV) transformer on the northwest corner of the property would be routed underground to Building 770.

Data lines would be routed from an existing blockhouse complex east of Building 770 to Building 770 using an existing aboveground cable tray (Figure 2-3). Data lines that would be routed along the west wall of Building 770 would be buried (Figure 2-3). The trench for the underground data lines would be approximately 100 feet long, 4 feet wide, and 4 feet deep. An existing camera tower located within the boundaries of the SLC-3E launch facility would be used to the extent possible for monitoring and filming launches at SLC-3W.

Potable water lines for domestic water use would be reinstalled in Building 770 by tapping into an existing 20-inch main water line located on the eastern edge of the launch site (Figure 2-3). The trench for the water line would be approximately 500 feet long, 4 feet wide, and 4 feet deep. The 20-inch main would also provide water for the launch deluge water system (Section 2.1.1.6). Backflow prevention assemblies (BPAs) would be installed where any cross-connections to the existing water system would be created.

All excavation, trenching, and shoring activities would comply with OSHA requirements contained in 29 CFR 1926.650, 1926.651, and 1926.652.

The former aeration domestic wastewater treatment plant serving both SLC-3E and SLC-3W was converted to a septic system after SLC-3W operations had ceased. That septic system will be evaluated to determine if the system has sufficient capacity to be connected to Building 770. If it is found to not have sufficient capacity, Space X would use an aboveground septic tank and employ a contractor to pump and haul domestic wastewater off-base for proper disposal (see Section 3.7, Water Resources).

The approximately 480 foot long and 20 foot wide existing dirt access road to the launch facility at SLC-3W would be regraded and repaved with asphalt. No expansion of the existing roadbed is required. A parking area would also be established on the south side of Building 770 using existing road base (Figure 2-3).

2.1.2.2 New Facilities

No new buildings would be constructed under the proposed project.

2.1.2.3 Construction Requirements

A description of the projected equipment needs and anticipated construction schedule and workforce for the refurbishment of SLC-3W is provided below.

Projected Equipment Needs

Use of the following types (and numbers) of construction equipment would be necessary for refurbishing SLC-3W:

- Excavator (2)
- Scraper (2)
- Motor grader (2)
- Dozer (2)
- Backhoe/Skip loader (2)
- Rubber tire loader (2)
- End dump truck (2)
- Pickup truck (4)
- Ready mix truck (1)
- Concrete pump (1)
- Asphalt truck (1)
- Asphalt paver (1)
- Steel wheel roller (1)
- Hydraulic saw (1)
- Crusher (1)

Construction Schedule and Workforce

Refurbishing of SLC-3W is estimated to take 3 to 5 months. A maximum daily workforce of 15 people during construction is anticipated, with an average of 5 workers per day.

Best Management Practices

The following standard best management practices would be implemented during construction to reduce PM_{10} emissions and to reduce or avoid soil erosion during construction to avoid potentially significant air and water quality impacts:

- During refurbishment, water trucks or sprinkler systems would be used to keep all areas of vehicle movement damp enough to prevent dust from leaving the site. At a minimum, this would include wetting down such areas in the late morning and after work is complete for the day. Increased watering frequency would take place whenever the wind speed exceeds 15 miles per hour. This practice would also ensure compliance with Santa Barbara County Air Pollution Control District (District) Rule 302 *Visible Emissions*.

- Vehicle speed on unpaved areas would be no more than 15 miles per hour.

- Any imported, exported, and stockpiled fill material would be covered. All trucks transporting material would be tarped from the point of origin.

- Soil excavated from utility trenches would be used as backfill into the trenches, and trenches would be properly stabilized using slope benching or shoring techniques, to ensure no net loss of soil from the project area.

- To minimize erosion during refurbishment, earthwork activities will not be conducted in heavy rain and preference will be given to substantial activities during the dry season (typically April through November).

- The contractor's foreman would be responsible for implementing and monitoring the best management practices. The best management practices would also be noted on any grading plans.

- Launches will not be conducted during storm events and any launch deluge water would be pumped out of the retention basin within 1 week. In addition, deluge water levels in the retention basin will be monitored on a daily basis. If a rain event occurs occurs while deluge water is still in the retention basin, it will be removed immediately.

Space X would also be subject to compliance with any additional Vandenberg AFB Phase II storm water best management practices.

2.2 ALTERNATIVES TO THE PROPOSED ACTION

2.2.1 Alternative 1

Alternative 1 would be identical to the Proposed Action except a deluge water system would not be used. Launch of the Falcon is feasible without a deluge water system; however, the noise and fire suppression benefits associated with the deluge water system would not exist.

2.2.2 No-Action Alternative

Under the No-Action Alternative, SLC-3W would remain undeveloped and the Falcon Launch Vehicle Program would disband and cease to exist. SLC-3W would not be used to meet the National Space Transportation Policy's goal of providing low-cost and reliable access to space. The Commercial Space Launch Act's goal to encourage the use of underutilized government infrastructure and resources to promote commercial investment and use of space would also not be realized at SLC-3W.

2.3 ALTERNATIVES CONSIDERED AND DISMISSED FROM FURTHER CONSIDERATION

2.3.1 Use of the SSI Commercial Launch Facility

Use of the SSI Commercial Launch Facility was considered for the Falcon Launch Vehicle Program. However, this location was dismissed from further consideration because it is not compatible with a vehicle that uses liquid propellants. For example, the asphalt pad area is not compatible with LOX operations; there are no liquid propellant storage or plumbing systems available; the existing launch stool is not compatible with liquid propellant engines; and there is no launch water deluge system in place.

2.3.2 Use of SLC-3E

Use of SLC-3E was considered for the Falcon Launch Vehicle Program. However, this location is currently being used for the Atlas II Launch Program run by the U.S. Air Force. The infrastructure at SLC-3E, including the size of the service tower, is designed for vehicles that are much larger than the Falcon. Therefore, SLC-3E was determined to be non-available for as well as incompatible with the Falcon Launch Vehicle Program and was dismissed from further consideration.

2.3.3 Use of SLC-4W

Use of SLC-4W was considered for the Falcon Launch Vehicle Program. However, this location is currently being used for the Titan II Launch Program run by the U.S. Air Force and there are currently two more Titan II launches scheduled from this site. Additionally, the hydrazine fuel storage tanks may be used by the National Aeronautics and Space Administration (NASA) for storage of hydrazine through 2004. As with SLC-3E, the infrastructure is designed for vehicles that are larger than the Falcon; in addition, all propellant systems are designed for hypergolic fuels and oxidizers and are not compatible with RP-1 and LOX. Therefore, SLC-4W was determined to be non-available for and incompatible with the Falcon Launch Vehicle Program and was dismissed from further consideration.

2.3.4 Use of Other Geographical Launch Sites

The use of a Vandenberg AFB launch site is essential for high inclination launches. Other geographical sites were considered and dismissed from further consideration as an alternate to Vandenberg AFB. These sites were:

- Cape Canaveral, Florida. Space X would use Launch Complex 46 for low inclination launches. However, use of Cape Canaveral for high inclination launches would require overflight of populated areas. Therefore, Cape Canaveral was dismissed from further consideration for high inclination launches, and Vandenberg AFB was chosen instead.

- Kwajelein Island, South Pacific Ocean. Space X is currently evaluating the use of Kwajelein for very low inclination launches.

- Kodiak, Alaska. Space X evaluated this location as an alternate to Vandenberg AFB; however, the logistics involved with use of this location and the weather (cold temperatures, substantial rainfall, and poor visibility) make this site not suitable for Falcon operations.

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3.0 AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

This section describes the existing environment at Vandenberg AFB within the Region of Influence of the proposed project, and serves as a baseline from which to identify and evaluate potential environmental impacts that could result from implementing the Proposed Action or Alternatives.

The Region of Influence of the proposed project includes SLC-3W and a 60-meter radius around SLC-3W (in the event of an on-pad mishap), and within the range of the Falcon vehicle—or the land and sea below the flight path of the Falcon vehicle.

3.1 LAND USE/VISUAL RESOURCES

This section describes the existing environment in terms of land use and visual resources for the launch site at SLC-3W, Vandenberg AFB and for areas within the flight range of the Falcon Launch Vehicle Program (range). Topics addressed are regional land use, on-base land use, coastal zone management, recreation, and aesthetics. Space X use of Air Force real property, equipment, and services would follow the terms and conditions of the ESOSA (U.S. Air Force 2002a).

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable.

Potential issues typically stem from encroachment of one land use or activity on another, or an incompatibility between adjacent land uses that leads to encroachment. The Air Force coordinates with surrounding local and state jurisdictions to ensure that off-base development does not encroach on Vandenberg AFB installation activities, and that installation activities do not encroach on, or create land use incompatibilities with, off-base uses.

Visual resources include natural and man-made features that give a particular environment its aesthetic qualities. The analysis considers visual sensitivity, which is the degree of public interest in a visual resource and concern over adverse changes in the quality of the resource.

3.1.1 Launch Site

3.1.1.1 Land Use

Vandenberg AFB encompasses approximately 99,100 acres, representing approximately 6 percent of the total land area of Santa Barbara County. According to the Base General Plan (Vandenberg AFB 2000), the base comprises the following land use areas: airfield operations and maintenance/space and missile launch activities, industrial, outdoor recreation, open space, and cantonment. The cantonment area is centrally located on North Vandenberg AFB and includes residential, administrative, industrial, recreational, open space, airfield, and community land uses.

The greatest use of land on Vandenberg AFB (approximately 90 percent) is for open space, followed by industrial (approximately 6 percent), and aircraft operations and maintenance/space and missile launch activities (approximately 2 percent). A major mission of Vandenberg AFB is to provide support to the government and commercial entities for low-cost and reliable access to space.

The majority of South Vandenberg AFB is undeveloped; the developed portion includes launch complexes, test/launch facilities, technical support areas, several mountaintop tracking stations, and a 150-acre administrative/industrial area. In addition, the Boathouse Flats area on South Vandenberg AFB, the former location of the U.S. Coast Guard Rescue Station, provides Air Force personnel and their guests with picnicking, diving, swimming, and fishing recreation opportunities. Approximately 1,800 persons use this area annually. Boathouse Flats is located on the coast south of SLC-6. This area is currently closed during low-azimuth Atlas, Delta, and Titan launches similar to Jalama Beach County Park (see Section 3.1.2, Range).

SLC-3W is located on South Vandenberg AFB and covers 33 acres. This facility was used for Atlas D/Agena launches from 1960 to 1963, for Thor Agena launches from 1963 to 1972, and for Atlas E/F launches from 1972 to 1995.

3.1.1.2 Visual Resources

South Vandenberg AFB is characterized by the somewhat rugged terrain of the western Santa Ynez Mountains, which rise to more than 2,000 feet at Tranquillon Peak. From this elevation, the mountains drop toward the coast, terminating at a narrow marine terrace at about 50 to 100 feet above the ocean. Slopes and terraces are covered with grasses and chaparral or coastal sage vegetation. With the exception of scattered launch facilities, significant aspects of the natural environment are the rugged coastline and adjacent mountain slopes that provide historic vistas and natural viewsheds. The most significant man-made features are the launch complexes.

Views of South Vandenberg AFB from the east, and from approximately 40 miles of coastline, are generally restricted by distance from public/private land, limited roadways, and the topography of the Santa Ynez Mountains that extend to Point Arguello at Cypress Ridge. Since public access to South Vandenberg AFB is generally not permitted, current viewpoints are primarily limited to marine traffic, passengers on the Southern Pacific Railroad traversing the area parallel to the coastline, and views from Ocean Beach and Jalama Beach county parks. Local views of the project area from surrounding roads are restricted to authorized base personnel and visitors.

3.1.2 Range

3.1.2.1 Land Use

Santa Barbara County and the city of Lompoc are the local planning authorities for both incorporated and unincorporated areas adjoining the base. Of these planning authorities, only the county adjoins areas of South Vandenberg AFB near SLC-3W. Neither the county nor the city of Lompoc have land use authority over Vandenberg AFB because it is federally owned. Vandenberg AFB designates its own land use and zoning regulations. The general plans of the county and city of Lompoc designate compatible land uses around Vandenberg AFB.

Santa Barbara County land use plans designate much of the area adjoining the base as agricultural. Other non-urban land east of the base is designated for rural residential use. Two large ranches, the Bixby Ranch and the Hollister Ranch, are located more than 10 miles southeast of SLC-6. Although some residential development has occurred, these ranches have been traditionally used for cattle grazing.

The dominant land use within the city of Lompoc is urban. Outside of this area, other land uses adjacent to the base are primarily agriculture and grazing, with some scattered oil production activities and other undeveloped uses (primary recreation). To the west, offshore uses of the Pacific Ocean and beaches

include primarily oil production, commercial fishing, and recreation. Three public beaches are near the base: Point Sal Beach State Park just outside the northern edge of Vandenberg AFB, Ocean Beach County Park at the terminus of State Route (SR) 246 near the north/south division of Vandenberg AFB, and Jalama Beach County Park, which is just outside the southern edge of the base.

Jalama Beach County Park is situated at the southern end of the base and is reached via Jalama Road from SR 1. Amenities are provided for day-use picnicking, and there are approximately 100 sites available for overnight camping. The park is currently closed to the public during low-azimuth Atlas, Delta, and Titan launches. The Santa Barbara County Parks Department, County Sheriff, and California Highway Patrol are notified of scheduled launch events. Park rangers post a notice indicating the time and date of park closure. On the day of a launch, the County Sheriff initiates procedures for each closure, and park rangers begin to leave the area 2 to 3 hours prior to each launch. Following the launch or launch cancellation, the Air Force informs the park ranger and sheriff, and the park is reopened.

Table 3-1 presents the number of past closures of Jalama Beach County Park due to launches at Vandenberg AFB. Between 1994 and 2003, the park averaged two closures per year. The park is closed for approximately 3 to 4 hours per launch event. However, longer closures have occurred for a single launch event due to a launch abort or a rescheduled launch resulting from unsuitable weather conditions or mechanical problems. For night launches, the park is usually closed by the park rangers at dusk to avoid potential traffic problems on Jalama Road, thus extending the closure period for these types of launches.

Table 3-1
Beach Closure Data for Launches at Vandenberg AFB

Year	Ocean Beach County Park	Jalama Beach County Park
2003	3	1
2002	3	1
2001	6	3
2000	5	2
1999	7	4
1998	8	1
1997	8	2
1996	4	2
1995	3	1
1994	4	1

Ocean Beach County Park is located between North and South Vandenberg AFB and is reached via SR 246. The park provides amenities for day-use picnicking and sightseeing. Ocean Beach County Park is also currently closed for Atlas, Delta, and Titan launches. Table 3-1 presents the number of past closures of Jalama Beach County Park due to launches at Vandenberg AFB. Closure procedures for this park are similar to those used for Jalama Beach County Park. Between 1994 and 2003, the park was closed an average of five times per year due to launches.

The Channel Islands National Park, Channel Islands National Marine Sanctuary, and an International Biosphere Reserve lie off the coast of Santa Barbara County in and surrounding the Channel Islands (see Figure 3-5). These areas have been designated and set aside to protect the significant biological, cultural, and geological resources on and near the islands. The biological and cultural resources of the areas include internationally significant pinniped and seabird colonies, some of the oldest archaeological sites

in the Western Hemisphere, and unique geological landforms. Land use on the islands includes visitation by the public, land management, education, and research. Use of the nearshore marine environment at the islands includes substantial recreational activities and commercial fishing.

Although federal land is not included in coastal zones, a federal activity or issuance of a federal license or permit for an activity in, or affecting, a coastal zone must comply with the federal Coastal Zone Management Act of 1972, as amended (Public Law 92–583). Section 106(d)(6) of the Act gives the California Coastal Commission authority over activities occurring within the coastal zone. The Coastal Commission subsequently developed the California Coastal Zone Management Program, the key policy component of the program being the California Coastal Act of 1976. One of the state policies on coastal zone conservation and development decisions is to protect marine and land resources including wetlands, rare and endangered habitat areas, environmentally sensitive areas, tidepools, and stream channels.

Prior to receiving a federal license or permit for an activity in the California coastal zone, the applicant must submit environmental documentation (a Coastal Consistency Certification) to the Coastal Commission that includes a discussion of potential impacts to issue areas pertaining to coastal resource planning and management policies. If the proposed project is found to be consistent with the applicable policies, the Coastal Commission will approve the Coastal Consistency Certification.

Under the Coastal Plan for Santa Barbara County, the Santa Barbara County coastline is divided into seven sub-areas, including the sub-area along the western boundary of Vandenberg AFB, which lies under the flight range of the Falcon Launch Vehicle Program.

3.1.2.2 Visual Resources

The visual environment in the vicinity of Vandenberg AFB is varied, contains historic vistas and natural viewsheds, and is characterized by rolling hills covered with chaparral and oak trees, valleys used for grazing or more intensive agriculture, and urbanized areas of the Lompoc Valley. Topography is largely dominated by the east-west–trending Santa Ynez Mountains, which narrow toward the coast and terminate at Point Arguello. Views of the coastline are generally not available from inland locations due to access limitations and intervening topography.

The marine traffic off the western border of Vandenberg AFB consists primarily of fishing vessels and occasional pleasure boats. Visibility from the ocean is limited. Passenger railroad traffic provides the closest views of the area; about four passenger and eight freight trains pass through Vandenberg AFB daily. From the west, views for marine and railroad traffic include both SLC-3 and SLC-6. The South Vandenberg AFB coastline north of Point Arguello is not visible from Ocean Beach County Park. Views from this location include SLC-3 and SLC-4; SLC-6 is not visible from the park.

From the south, the South Vandenberg AFB coastline can be seen from Jalama Beach County Park, which offers views north to Point Arguello. This area offers expansive views that show the predominantly undeveloped nature of the coastline. Existing launch facilities, such as SLC-3 and SLC-6, cannot be seen from this location due to the intervening topography of the Santa Ynez Mountains.

3.2 NOISE

3.2.1 General Description

Noise is usually defined as unwanted sound. It may be undesirable because it interferes with speech communication and hearing, is intense enough to damage hearing, or is simply annoying to humans. For

wildlife, noise can have physiological and behavioral effects that ultimately could affect survival and reproduction at an individual and population level.

Noise levels often change with time. Therefore, to compare levels over different time periods, several descriptors were developed to account for the time variances. These descriptors are used to assess and correlate the various effects of noise on humans, including land use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects. Although derived for humans, these descriptors can also be used to qualitatively assess the effects of noise on wildlife.

These descriptors are used to assess and correlate the various effects of noise on humans, including land use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects:

- A-weighted sound level. An A-weighted sound level is the momentary magnitude of sound weighted to approximate the human ear's frequency sensitivity. A-weighted sound levels are typically measured between 20 hertz and 20 kilohertz.

- The long-term equivalent A-weighted sound level (Leq). The Leq is an A-weighted sound level that is "equivalent" to an actual time-varying sound level.

- Day-night average noise level (L_{DN}). The L_{DN} has been adopted by federal agencies as the standard for measuring noise. The L_{DN} is an A-weighted equivalent sound level averaged over a 24-hour period with a 10-decibel (dB) "penalty" added to nighttime sounds (10:00 p.m. to 7:00 a.m.).

- C-weighted sound level. C-weighting measures sound levels in dB, with no adjustment to the noise level over most of the audible frequency range except for a slight de-emphasis of the signal below 100 hertz and above 3,000 hertz. C-weighting is used as a descriptor of low-frequency noise sources, such as blast noise and sonic booms.

- C-weighted day-night level (CDNL). The CDNL is the C-weighted sound level averaged over a 24-hour period, with a 10-dB penalty added for noise occurring between 10:00 p.m. and 7:00 a.m. CDNL is similar to L_{DN}, except that C-weighting is used rather than A-weighting.

- Sound exposure level (SEL). The SEL is the total sound energy in a sound event if that event could be compressed into one second. SEL converts the total sound energy in a given noise event with a given duration into a 1-second equivalent, and, therefore, allows direct comparison between sounds with varying intensities and durations.

- C-weighted sound exposure level (CSEL). The CSEL is a C-weighted SEL.

- Sound pressure level (SPL). The SPL is measured in decibels and corresponds approximately to the minimum audible sound pressure.

- Peak overpressure. Peak overpressure is a measure of changes in air pressure and is measured in units of pounds per square foot. Peak overpressure is often used to measure the magnitude and intensity of sonic booms, particularly with respect to evaluating the potential for structural damage.

- Community noise equivalent level (CNEL) has been adopted by the State of California as the descriptor for measuring noise levels. The CNEL is similar to the L_{DN}, except that it includes a 5 dB penalty for evening noise (7:00 p.m. to 10:00 p.m.) in addition to the 10 dB "penalty" for nighttime noise.

Examples of typical A-weighted sound levels are shown in Figure 3-1. Sound level estimates are usually presented as noise contours. Noise contours are lines on a map of a noise source and its vicinity where the same sound level is predicted to occur. The 5-dB interval chosen to represent noise contours reflects the Department of Housing and Urban Development noise criteria commonly used for airfield or launch site noise. The Department considers sound level ranges in relation to residential use of the land.

3.2.2 Ambient Noise Levels

On-Base

North Vandenberg AFB contains most of the base facilities, and South Vandenberg AFB is largely undeveloped with some scattered facilities. Noise levels measured on North Vandenberg AFB are generally typical of levels in urban areas with little industrialization. Noise levels on South Vandenberg AFB would be expected to be similar to levels found in rural areas, except around active launch complexes, where noise levels during operations may be similar to those at an industrial site.

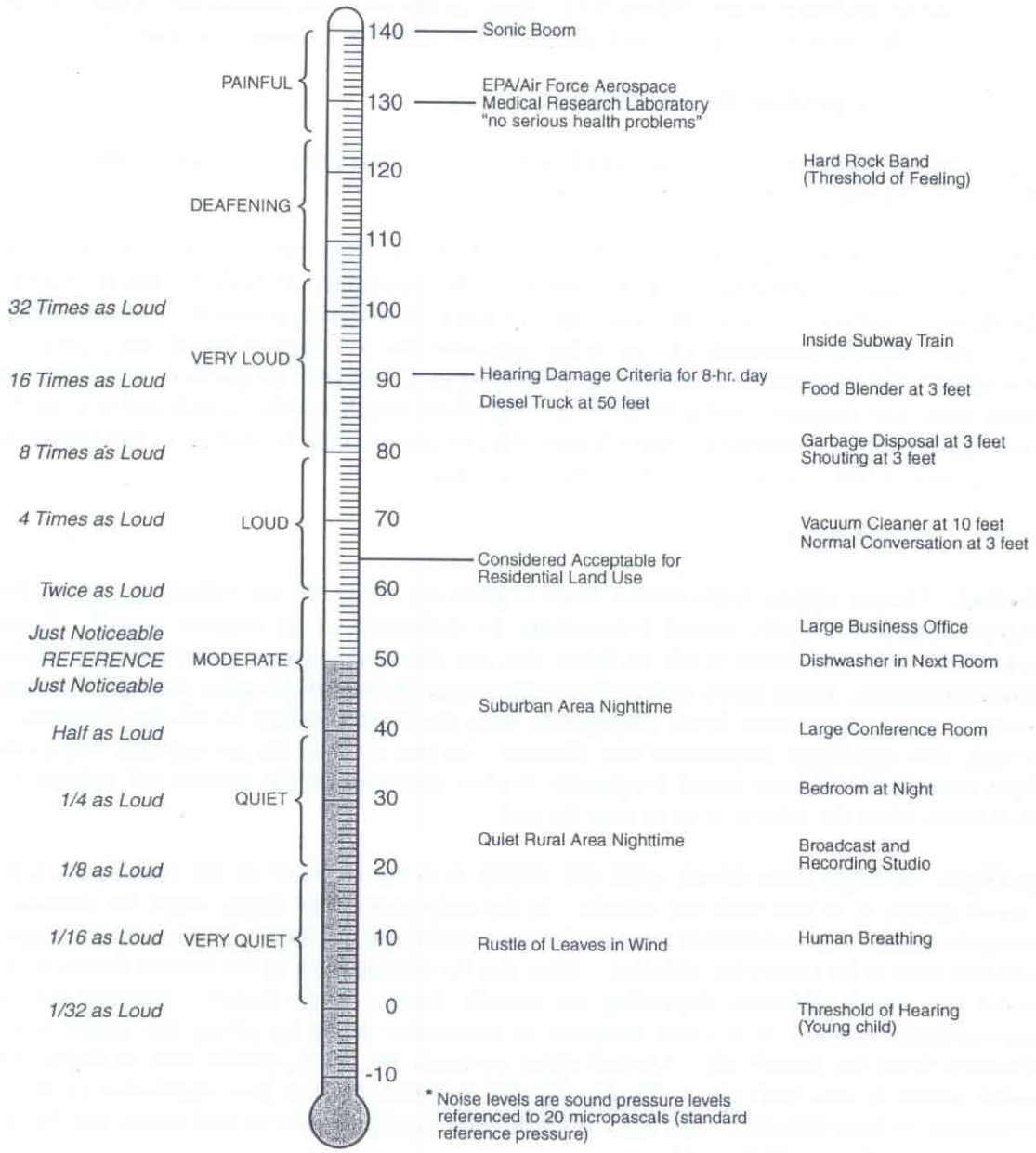
An additional source of noise in the area is the Vandenberg AFB Airfield, which follows state regulations concerning noise and maintains a Ldn equivalent to 65 dBA or lower for off-base areas. Two types of operations take place at this airfield: regular takeoffs and landings and touch-and-go maneuvers. Touch-and-go maneuvers are used for training purposes and create noise levels similar to regular aircraft takeoffs and landings (City of Lompoc 1996). Other less frequent, but more intense, sources of noise in the region are existing space and missile launches from Vandenberg AFB (see below).

Off-Base

The area immediately surrounding Vandenberg AFB is mainly undeveloped and rural, with some unincorporated residential areas within the Lompoc and Santa Maria valleys. The two urban areas in the region are the cities of Lompoc and Santa Maria, which support a few localized industrial areas. Sound levels measured for most of the region are normally low, with higher levels appearing in industrial areas and along transportation corridors. Rural areas in the Lompoc and Santa Maria valleys would be expected to have low overall Ldn levels, normally about 40 to 45 dBA.

Urban areas are primarily affected by noise from automobiles, trucks, trains, and aircraft. Ldn contours have been measured based on typical sound levels in the Lompoc area. These contours show the highest Ldn levels (greater than 65 dBA) appearing around the Southern Pacific Railroad and major roadways, with lower Ldn levels (50 to 65 dBA) farther from main transportation corridors. Sound levels in Santa Maria are expected to be similar to those in Lompoc (City of Lompoc 1996). Areas of higher localized noise levels would occur around stationary industrial sources. Presently, few of these stationary sources exist in the Lompoc and Santa Maria areas; consequently, overall sound levels are relatively low (U.S. Air Force 1989a).

Infrequent aircraft flyovers and rocket launches from Vandenberg AFB currently increase noise levels in these areas for short periods of time (City of Lompoc 1996). Based upon actual measurements (SRS Technologies 2001) of sound levels from Atlas IIAS launch vehicles launched in December 1999 and



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EXAMPLES OF TYPICAL A-WEIGHTED SOUND LEVELS

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Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	5/21/03	RANDALL	U.S AF	g:/commercial/1295-03 XSPACE/3-1NoiseLevels.ai	3-1

November 2001 at SLC-3E, maximum noise levels were 141.6 and 135.4 dB, in 1999 and 2001 respectively, at a distance of 3 miles from the launch pad (approximate closest point off-base). These noise levels, converted to the A-weighted scale, would be in the range of 101 to 107 dBA (Figure 4-1), or a very loud to deafening noise (Figure 3-1). Noise produced in the immediate vicinity of the launch site tends to be low frequency sound of short duration (i.e., less than 1 minute) (Versar 1991).

3.2.3 Operation-Related Noise

Three distinct noise events are associated with launch and ascent of a launch vehicle: on-pad engine noise, in-flight engine noise, and sonic booms.

The launch is the major source of operational noise; all other noise sources in the launch area are considered minor compared to launch noise. The operation of launch vehicle engines produces significant sound levels. Generally, four types of noise occur during a launch: (1) combustion noise from the launch vehicle chambers, (2) jet noise generated by the interaction of the exhaust jet and the atmosphere, (3) combustion noise from post-burning of combustion products, and (4) sonic booms. The initial loud, low frequency noise heard in the immediate vicinity of the launch pad is a result of the first three types of noise combined. Sonic boom patterns are oriented according to the launch azimuth and occur a considerable distance away from the launch pad.

3.2.3.1 Engine Noise

On-Pad. On-pad engine noise occurs when engines are firing but the vehicle is still on the pad. The engine exhaust is usually turned horizontally by deflectors or an exhaust tunnel. Noise is highly directional, with maximum levels in lobes that are about 45 degrees from the main direction of the deflected exhaust. Noise levels at the vehicle and within the launch complex are high. Because the sound source is at or near ground level, propagation from the launch vehicle to off-site locations is along the ground, with significant attenuation over distance. On-pad noise levels are typically much lower than in-flight noise levels because sound propagates in close proximity to the ground and undergoes significant attenuation when the vehicle is on or near the pad.

In-Flight. In-flight noise occurs when the vehicle is in the air, clear of the launch pad, and the engine exhaust plume is in line with the vehicle. In the early part of the flight, when the vehicle's motion is primarily vertical, noise contours are circular, particularly for the higher levels near the center. The outer contours tend to be somewhat distorted. They can be stretched out in the launch direction or broadened across the launch direction, depending on specific details of the launch. Because the contours are approximately circular, it is often adequate to summarize noise by giving the sound levels at a few distances from the launch site. On-pad noise contours are much smaller than in-flight contours. The sound source is also well above the ground and therefore there is less attenuation of the sound as it propagates to large distances. Because in-flight noise is greater than on-pad noise, analysis in this study has concentrated on in-flight noise.

The major source of in-flight noise is from mixing of the exhaust flow with the atmosphere, combustion noise in the combustion chamber, shock waves and turbulence in the exhaust flow, and occasional combustion noise from the post-burning of fuel-rich combustion products in the atmosphere. The emitted acoustic power from a rocket engine and the frequency spectrum of the noise can be calculated from the number of engines, their size and thrust, and their flow characteristics. Normally, the largest portion of the total acoustic energy is contained in the low-frequency end of the spectrum (1 to 100 hertz).

3.2.3.2 Sonic Booms

Another characteristic of launch vehicles is that they reach supersonic (faster than the speed of sound) speeds and will generate sonic booms. A sonic boom, the shock wave resulting from the displacement of air in supersonic flight, differs from other sounds in that it is impulsive and very brief (less than 1 second for aircraft; up to several seconds for launch vehicles). Sonic booms are generally described by their peak overpressure in pounds per square foot (psf.). Figure 3-2 shows nominal noise contours for the sonic boom from a launch vehicle (U.S. Air Force 1998a). The contour values represent psf, the unit used for sonic boom overpressures. The launch site is noted on the figure, and the launch direction is to the right. Regions within each contour experience overpressures equal to or greater than that denoted for the contour. The contours denote the peak pressure that occurs at each point over the course of the launch

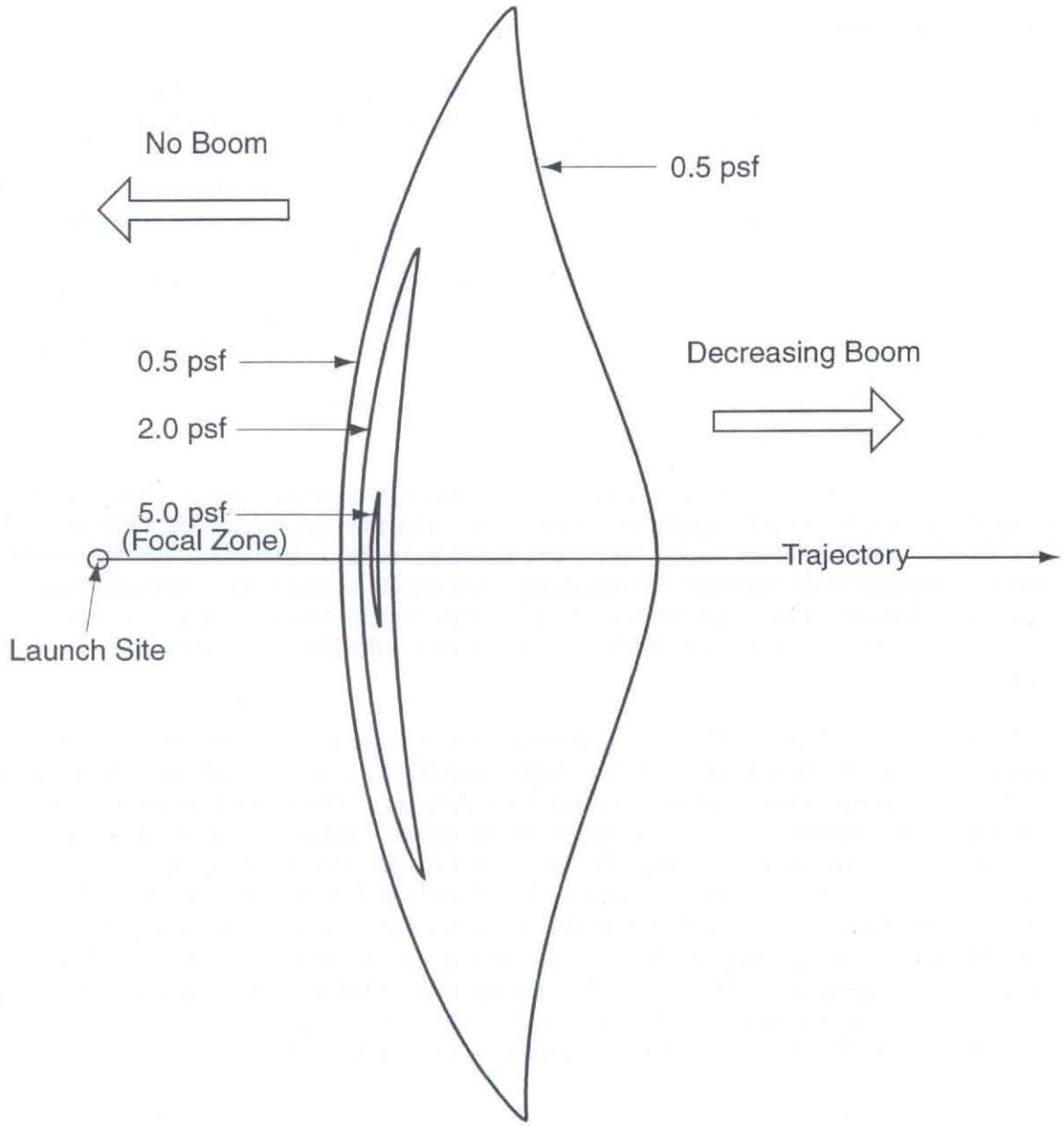
and do not represent noise at any one time. The sonic boom event at each position is brief, as noted in the preceding paragraph.

Because a sonic boom is not generated until the vehicle reaches supersonic speeds some time after launch, the launch site itself does not experience a sonic boom. The crescent shape of the contours reflects this "after launch" nature of sonic boom. The entire boom footprint is downtrack, and the portions of the footprint to the side of the trajectory (up and down in the figure) represent the overpressures caused as the shock wave expands radially from the line of travel of the launch vehicle. There is actually no boom to the left of the contours shown, and the boom diminishes rapidly further downtrack, to the right of the contours.

The 0.5-psf contour shown in Figure 3-2, although not to scale, has a shape similar to an actual low-overpressure sonic boom contour. The two higher contours, 2.0 and 5.0 psf, have been considerably distorted from typical actual contours for illustrative purposes. The crescent shape is correct, and the width across the trajectory (i.e., vertical height on the figure) relative to that of the 0.5-psf contour is approximately correct. However, their width and position in the direction along the trajectory are greatly exaggerated for illustrative purposes. Typically, the left edge of these higher overpressures would be very close to the left edge of the 0.5-psf contour and would not appear as a distinct line when plotted to any reasonable scale. The right edge of these contours would also be much closer to the left than shown and would often not appear as distinct lines. The concentration of these contours is due to focusing of the boom as the vehicle accelerates. The focal zone "super boom" region is within the 5.0-psf contour illustrated in Figure 3-2 and is very narrow (typically less than 100 yards).

It is common to calculate sonic boom footprints with the assumption that the ground is hard and does not significantly attenuate the boom. This is usually a good assumption for most of the footprint. However, near the edges of the footprint, the boom approaches the ground at a shallow angle and is attenuated by the same process discussed previously for on-pad rocket noise. This is typically important in the outermost 20 percent of the width of the outermost contour (the 0.5-psf contour in Figure 3-2). The attenuated sonic boom in this region sounds like rumbling or distant thunder, rather than the distinct double bang usually associated with sonic booms.

Many studies have been conducted on the effects of sonic booms on conventional (i.e., modern, inhabited) structures. Sonic boom overpressure, in units of psf, is the typical metric used to evaluate sonic boom impacts on structures.



LEGEND

psf pounds per square foot

Source: Modified from U.S. Air Force 1998a.

Not to Scale

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NOMINAL SONIC BOOM CONTOURS FOR ASCENT OF A LAUNCH VEHICLE

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4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO
12958-03	5/21/03	RANDALL	EELV/095	g:/commercial/1295-03 XSPACE/3-2nominalboom.ai	3-2

The most common incidence of damage is to glass, plaster, and bric-a-brac. Table 3-2 lists the types of damage to structures that could potentially result from sonic booms. The actual occurrence of damage depends upon a number of variables; most important are the orientation of the object to the flight track, and the condition of the object.

Table 3-2
Possible Damage to Structures from Sonic Booms

Sonic Boom Peak Overpressure	Item Affected	Type of Damage
0.5–2 psf	Cracks in plaster	Fine; extension of existing; more in ceilings; over door frames; between some plaster boards
	Cracks in glass	Rarely shattered; either partial or extension of existing
	Damage to roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole
	Damage to outside walls	Existing cracks in stucco extended
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, e.g., large goblets
	Other	Dust falls in chimneys
2–4 psf	Glass, plaster, roofs, ceilings	Failures show which would have been difficult to forecast in terms of their existing localized condition; nominally in good condition
4–10 psf	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic; green houses; ships; oil rigs
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster
	Roofs	High probability rate of failure in nominally good slate, slurry-wash; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily
	Walls (outside)	Old, free-standing walls in fairly good condition can collapse
	Walls (inside)	Party walls known to move at 10 psf
Greater than 10 psf	Glass	Some good glass will fail regularly to sonic booms from the same direction; glass with existing faults could shatter and fly; large window frames move
	Plaster	Most plaster affected
	Ceilings	Plaster boards displaced by nail popping
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gable-end and wall-plate cracks; domestic chimneys - dislodgment if not in good condition
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage
	Bric-a-brac	Some nominally secure items can fall, e.g., large pictures; especially if fixed to party walls

Source: Haber/Nakaki 1989

3.2.4 Refurbishment-Related Noise

A temporary increase in ambient noise levels typically occurs at and near a refurbishment construction site due to the operation of most construction equipment (e.g., earth moving machinery, cranes, dump trucks, concrete saws). Typical construction equipment is muffled to not exceed the 85-dBA noise threshold limit value recommended for construction workers in an 8-hour day (American Conference of Governmental Industrial Hygienists 1992–1993). In addition, noise diminishes at a rate about 6 dBA for each doubling of distance from the source.

3.3 BIOLOGICAL RESOURCES

Approximately 30 vegetative assemblages, representing more than 15 distinct plant communities (Engineering Science, Inc.[ES] 1989a), have been identified within Vandenberg AFB (Schmalzer *et al.* 1988). Plant communities include coastal saltmarsh, coastal sage scrub, central dune scrub, riparian woodland, a variety of chaparral types, and diverse upland woodland communities. Approximately 85 percent of Vandenberg AFB supports "natural" vegetation; the remaining 15 percent supports a ruderal, or disturbed, vegetation or is developed for human use (ES 1989a). This diversity results from variation in topography, elevation, geology, and proximity to the coast.

The flora of Vandenberg AFB comprises approximately 850 species from more than 400 genera belonging to 96 plant families (Holland and Keil 1996). This includes a number of special-status plant taxa, including several species recognized as rare, threatened, and endangered by the state and federal government.

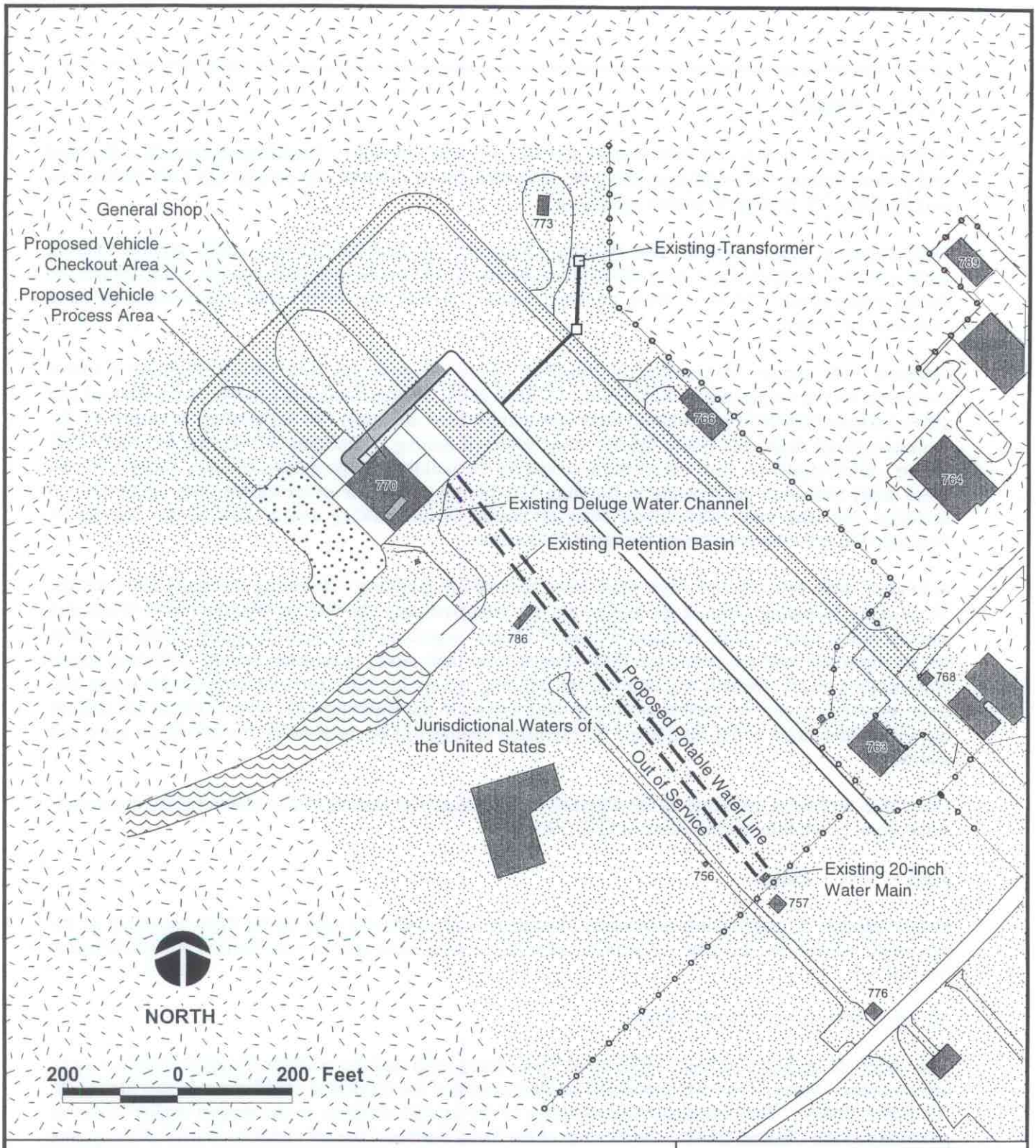
The project area is located in a region of great ecological and biogeographical interest because it encompasses the boundary between coastal southern and central California provinces. A number of plants and animals reach the northern, southern, or western limits of their ranges in or near the Vandenberg AFB area of western Santa Barbara County because it is situated at the southern end of the Coast Ranges and at the western end of the Transverse Ranges.

3.3.1 Launch Site

3.3.1.1 Vegetation

Nonnative grassland and a small area of willow riparian woodland habitat occur in the vicinity of SLC-3W (Figure 3-3). The nonnative grassland community is dominated by nonnative annual grasses including brome grass (*Bromus* sp.), veldt grass (*Ehrharta calydina*), wild oats (*Avena* sp.), and fescue (*Vulpia* sp.). A variety of both nonnative and native forb taxa are also common, including lupine (*Lupinus* sp.), owl's clover (*Orthocarpus purpurascens*), blue-eyed grass (*Sisyrinchium bellum*), and tomcat clover (*Trifolium tridentatum*). The grassland community also contains scattered, small-sized shrubs, such as the California sagebrush. Disturbed areas are dominated by veldt grass, black mustard (*Brassica nigra*), filaree (*Erodium* sp.), and California goosefoot (*Chenopodium californicum*).

Within the boundaries of SLC-3W, willow riparian woodland is located within an intermittent, small drainage ditch at the foot of the SLC-3W retention basin. The riparian woodland community, although not known to contain federally listed species, including the California red-legged frog, in the project area, is sensitive and protected because of the importance of wetlands for wildlife support and for hydrologic and water quality functions (see Section 3.7, Water Resources).



LEGEND

- Disturbed Ruderal Grasses
- Coastal Sage Scrub
- Building
- Proposed Asphalt Road
- Proposed Parking Area with Road Base
- Jurisdictional Waters of the United States
- Fence
- Street
- Proposed Underground Communication Lines
- Existing Potable Water Line
- Proposed Potable Water Line
- Proposed Underground Electrical

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PLANT COMMUNITIES AT SLC-3W

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4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	5/22/03	RANDALL	VAFB GIS	Graphics:common:sw 12958-03 SPACE-X/ 3-3 PlantComm.ai	3-3

3.3.1.2 Wildlife

Wildlife habitats at SLC-3W have been degraded by human activities. Disturbances include a dirt road and parking lot, mowed vegetation along the road shoulders and within the present SLC-3W boundaries, and Building 770 to support launch operations.

Only common wildlife species that frequent nonnative grassland habitat (e.g., deer, ground squirrel, white-crowned sparrow) have been observed at the launch site or are expected to occur at the launch site during construction. Most of these common wildlife species are mobile and would move to other locations for foraging.

Common bird species have nested in Building 770 in the past and were observed during a recent biological survey conducted at SLC-3W on 16 April 2003. House finches (*Carpodacus mexicanus*) and cliff swallows (*Hirundo pyrrhonota*) have historically used Building 770 for nesting according to the presence of old nests, and house finches were observed nesting in Building 770 during the April 2003 survey. Cliff swallows were observed investigating the building for potential nest sites and a barn owl (*Tyto alba*) was observed roosting in Building 770, but no nests were observed for these species in the building. No other bird species were observed nesting in the building and no sign of bats roosting in Building 770 was observed during the April 2003 survey.

A total of three active house finch nests were observed in Building 770 during the April 2003 survey. These nests, including adults, eggs, and young, are protected under the federal Migratory Bird Treaty Act and Executive Order 13186, Responsibilities of Federal Agencies To Protect Migratory Birds, and must not be disturbed until the young are fully fledged from their nests. Exclusion netting (0.25-inch mesh) was installed on all windows and doors of the building, except for entry and exit ways for the active bird nests, however, to prevent further nesting by bird species in the Building 770. Once all birds are fledged from the active nests within Building 770, exclusion netting will be installed on the remaining entry and exit ways.

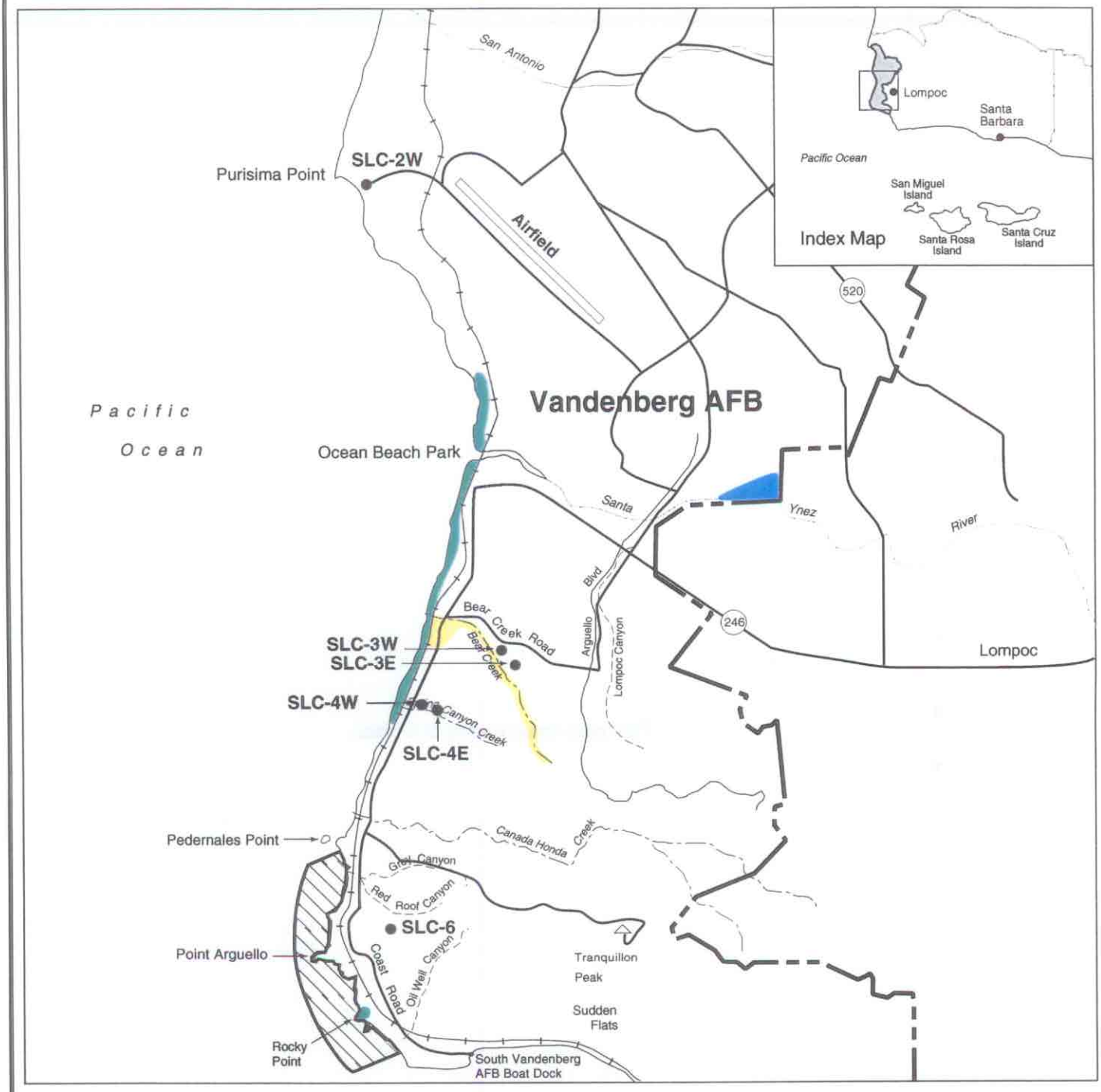
Other than bird nests protected by the Migratory Bird Treaty Act and Executive Order 13186, no special-status plant or wildlife species occur at SLC-3W.

3.3.2 Range

Several species of marine birds and marine mammals occur under the path of the flight trajectory of the proposed Falcon Launch Vehicle Program, including special-status species (see Section 3.3.3 b) (Figures 3-4 and 3-5).

3.3.2.1 Overview of Marine Birds

The variety of marine bird fauna offshore of Vandenberg AFB and the northern Channel Islands is large and complex. Many of the 101 species of seabirds recorded for California could occur in this area (U.S. Air Force 1998a). The abundance and diversity of the marine avifauna in the project region is due to proximity of the Channel Islands, the location of the Santa Barbara Channel along the Pacific Flyway, and the location of the project at a biogeographical boundary between warm southern and cold northern/offshore water masses.



LEGEND

- Base Boundary
- (246) State Route
- Marine Ecological Reserve
- Western Snowy Plover Nesting Area, California Least Tern Roosting Area, and/or Pinniped Haulout Areas
- Marine Mammals and Seabirds
- Southwestern Willow Flycatchers
- California Red-Legged Frogs

Source: Modified from U.S. Air Force 1998a.

0 .5 1 2 Miles

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NEARSHORE AND INLAND SPECIAL-STATUS BIOLOGICAL RESOURCES

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TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	2/11/03	RANDALL	EELV/106	g:/commercial/1295-03 XSPACE/3-4nearshore.ai	3-4

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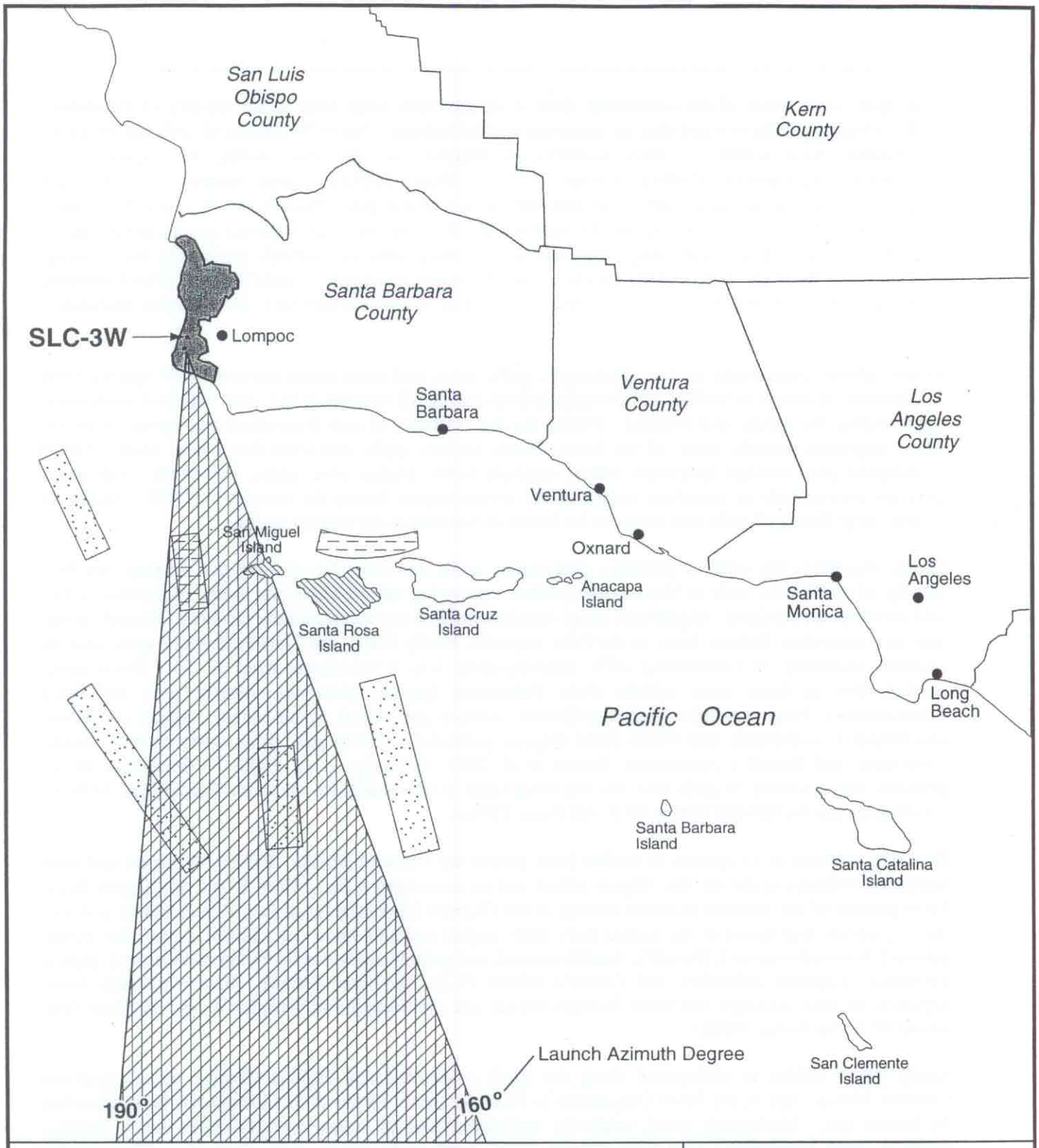

LEGEND

- Base Boundary
- Vandenberg AFB
- Range of potential launch azimuths. Azimuth is the compass direction along which the launch vehicle's ground track lies in its early flight.
- Concentration of Offshore Pinnipeds and Seabirds
- Concentration and Feeding Areas, All Cetaceans
- Additional Areas Used by Blue, Humpback, and Fin Whales

0 10 20 40 Miles

Source: Modified from U.S. Air Force 1998a.

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OFFSHORE SPECIAL-STATUS BIOLOGICAL RESOURCES UNDER THE RANGE

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TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-04	5/16/03	RANDALL	EELV/077	g:/commercial/1295-03 XSPACE/3-5boiresources.ai	3-5

The open ocean water of the continental shelf, a 20 kilometer wide zone in the vicinity of Vandenberg AFB, is highly productive and thus an important seabird habitat. Ten to 30 species of seabirds are known to frequent these waters. Seabird numbers are highest over the shelf during the summer; sooty shearwaters predominate (*Puffinus griseus*) (U.S. Air Force 1998a). Large numbers of arctic loons (*Gavia arctica*), sooty shearwaters, red and red-necked phalaropes (*Phalaropus* sp.), and Bonaparte's gulls (*Larus Philadelphia*) pass across the shelf waters of the project region during annual spring and fall migrations. This area is especially important as a feeding area for seabirds during the fall. Seabird abundance in the shelf waters of the project region is lowest in winter. Cassin's auklet (*Ptychoramphus aleuticus*), common murre (*Uria aalge*), and western gull (*Larus occidentalis*) are the most abundant in winter.

Loons, grebes, cormorants, scoters, phalaropes, gulls, terns, and some alcids use nearshore waters (within 1 kilometer of shore) as resting and foraging habitat during all seasons of the year. Highest abundances occur during the spring and summer. During the fall (October to mid-December) and spring (March to May) migration periods, many of the loons, brants, scoters, gulls, and terns that winter south of Point Conception pass through nearshore waters adjacent to the project area, gulls, cormorants, and brown pelicans predominate in nearshore waters of the project region during the summer and fall. During the winter, large flocks of gulls and terns can be found on beaches in the project region.

Rocky shorelines are used by pelicans, cormorants, gulls, and terns for roosting and nesting, and by a variety of shorebirds, such as black oystercatcher, wandering tattler, black and ruddy turnstones, willet, and surfbirds for foraging. Significant rocky shoreline habitat occurs around the northern Channel Islands and, in a somewhat disjunct form, in the Point Arguello, Rocky Point, and Point Pedernales areas near the southern boundary of Vandenberg AFB, approximately 6 to 9 kilometers from SLC-3. Documented nesting sites in these areas include Point Pedernales (pigeon guillemot, western gull, and black oystercatcher), Point Arguello (pigeon guillemot, western gull, black oystercatcher, pelagic cormorant, and Brandt's cormorant), and Rocky Point (pigeon guillemot, western gull, black oystercatcher, pelagic cormorant, and Brandt's cormorant) (Brown *et al.* 2001; Robinette *et al.* 2000). Cormorants, brown pelicans, and a variety of gulls also use the breakwater at the boathouse on south Vandenberg AFB for roosting during the fall and winter (U.S. Air Force 1998a).

Breeding colonies of 11 species of marine birds inhabit the Channel Islands. By far the largest and most important colonies occur on San Miguel Island and its associated islets, Prince Island and Castle Rock. Sixty percent of the seabirds recorded nesting in the Channel Islands occur at San Miguel Island, and 7 of the 11 species that breed in the region have their largest colonies there (i.e., Leach's and ashy storm-petrels [*Oceanodroma* sp.]; Brandt's, double-crested, and pelagic cormorants [*Phalacrocorax* sp.], pigeon guillemot [*Cepphus columba*]; and Cassin's auklet) (U.S. Air Force 1998a). Brown pelicans breed regularly on west Anacapa and Santa Barbara Islands and occasionally on Scorpion Rock, off Santa Cruz Island (U.S. Air Force 1998a).

Sandy beach habitat is widespread along the south coast of Santa Barbara County, on the northern Channel Islands, and in the Point Conception to Point Sal area. Much of this habitat has been disturbed by human use. Moderately sized, relatively undisturbed coastal dunes and associated sandy beaches occur on north Vandenberg AFB from Shuman Creek south to the mouth of the Santa Ynez River, in the vicinity of SLC-3. Shorebirds and several species of gulls and terns frequent sandy beaches for foraging and roosting in the project region (U.S. Air Force 1998a). Water pipit, yellow-rumped warbler, black turnstone, and short- and long-billed dowitchers forage along the upper portions of beaches, where rotting kelp attracts invertebrate prey. Species known to breed in sandy beach and blackdune habitats in the region include horned lark, Brewer's blackbird, and house finch (U.S. Air Force 1998a).

The state listed American peregrine falcon and federally listed western snowy plover breeds on the San Miguel and Santa Rosa Islands. The bald eagle (Haliaeetus leucocephalus), a state endangered species and species federally proposed for delisting have been recently reintroduced to the northern Channel Islands. There are currently 14 juvenile bald eagles on the northern islands.

3.3.2.2 Overview of Marine Mammals

The coastal waters encompassing south Vandenberg AFB and the northern Channel Islands support diverse marine mammal assemblages. The southern sea otter, six species of pinnipeds (seals), and more than 25 species of cetaceans (whales) inhabit the regions either as residents or transients. The Marine Mammal Protection Act of 1972 protects all marine mammals inhabiting the area underneath the flight trajectory of the launch vehicles (Figure 3-5). The Santa Barbara County Local Coastal Plan (Santa Barbara County 1980, 1982) identifies marine mammal haulout and pupping grounds (breeding activities). The largest concentration of marine mammals occurs on San Miguel Island. Only San Miguel Island supports colonies of northern fur seal. The Guadalupe fur seal, which historically occurred in great abundance along the Santa Barbara Channel is now a rare visitor to the western shores of San Miguel Island. San Miguel Island presently is the northern limit of the Guadalupe fur seal range (U.S. Air Force 1998a). The Steller sea lion once used San Miguel Island as a rookery, but pupping has not been known to occur there since the late 1970s. However, Steller sea lions were observed on San Miguel Island in the late 1990s. Approximately 75 percent of the estimated 135,000 seals and sea lions that inhabit the Southern California Bight spend at least some portion of the year in the northern Channel Islands (U.S. Air Force 1998a). The Rocky Point area of south Vandenberg AFB contains 12 haulout sites used by harbor seals and, to a lesser extent, by California sea lions and elephant seals (U.S. Air Force 1998a). A resident population of the southern sea otter exists at Purisima Point and there have been increased occurrences of the species off the south Vandenberg AFB coastline, particularly south of the Boathouse.

3.3.3 Special-Status Species

A number of threatened and endangered species is known or expected to occur on Vandenberg AFB and in the adjacent offshore waters. Table 3-3 lists all of the federally and state-listed threatened and endangered species, species proposed for federal listing as threatened or endangered, and candidate species for federal listing that are known to occur or that may potentially occur in the Vandenberg AFB area. In addition, California Department of Fish and Game species of special concern and Fully Protected Species are listed in Table 3-3.

3.3.3.1 Special-Status Plant Species

One special-status plant species, the beach layia (*Layia carnosa*), is located near SLC-3W. The beach layia is known from 19 extant populations with 300,000 individuals from Santa Barbara County to Humboldt County. The single, southernmost known locality for the species is found on Vandenberg AFB. This population is located along Coast Road, approximately 1.3 miles west of SLC-3 (U.S. Fish and Wildlife Service 1999).

3.3.3.2 Special-Status Wildlife Species

Several special-status bird species may occur within the range of the Falcon Launch Vehicle Program. These include the federal and state endangered California brown pelican (*Pelecanus occidentalis californicus*), California least tern (*Sterna antillarum browni*), and southwestern willow flycatcher (*Empidonax traillii extimus*); and a federally threatened and California Department of Fish and Game species of special concern, the western snowy plover (*Charadrius alexandrinus nivosus*). The state

endangered American peregrine falcon (*Peregrinus anatum*) and bald eagle also occur within the range of the Falcon Launch Vehicle Program. Several other bird species considered species of special concern by the California Department of Fish and Game also occur within the range, including the Cooper's hawk (*Accipiter cooperi*), ferruginous hawk (*Buteo regalis*), loggerhead shrike (*Lanius ludovicianus*), and the northern harrier (*Circus cyaneus*). Several cetacean and pinniped species are also present in the region (as discussed below). Finally, the federally threatened California red-legged frog, and the California Department of Fish and Game species of special concern, southwestern pond turtle (*Clemmys marmorata pallida*) and two-striped garter snake (*Thamnophis hammondii*) occur adjacent to SLC-3W, in Bear Creek Canyon. Species accounts are provided below for all federally listed wildlife species that occur in the project region.

Table 3-3
Special-Status Species Known to Occur or Potentially Occur at SLC-3W or Within the Range of the Falcon Launch Vehicle Program

Common Name	Scientific Name	Federal Status[1]	State Status[2]	CNPS Status[3]
PLANTS				
Beach layia	*Layia carnosa*	FE	SE	None
WILDLIFE				
Birds				
American peregrine falcon (nesting)	*Falco peregrinus anatum*	FD	SE, FP	
California brown pelican (roosting and nesting)	*Pelecanus occidentalis californicus*	FE	SE, FP	
California least tern (nesting colonies)	*Sterna antillarum browni*	FE	SE, FP	
Cooper's hawk (nesting)	*Accipiter cooperi*		CSC	
Ferruginous hawk (wintering)	*Buteo regalis*		CSC	
Loggerhead shrike	*Lanius ludovicianus*		CSC	
Northern harrier (nesting)	*Circus cyaneus*		CSC	
Southwester willow flycatcher (nesting)	*Empidonax traillii extimus*	FE	SE	
Western snowy plover	*Charadrius alexandrinus nivosus*	FT	CSC	
Bald Eagle	*Haliaeetus leucocephalus*	FPD	SE, FP	
Mammals				
Blue whale	*Balaenoptera musculus*	FE		
Finback whale	*Balaenoptera physalus*	FE		
Guadalupe fur seal	*Arctocephalus townsendi*	FT	ST	
Humpback whale	*Megaptera novaeangliae*	FE		
Right whale	*Balaena glacialis*	FE		
Sei whale	*Balaenoptera borealis*	FE		
Sperm whale	*Physeter catodon*	FE		
Southern sea otter	*Enhydra lutris nereis*	FT		

Table 3-3, Page 1 of 2

Table 3-3
Special-Status Species Known to Occur or Potentially Occur at SLC-3W or Within the Range of the Falcon Launch Vehicle Program (Continued)

Common Name	Scientific Name	Federal Status[1]	State Status[2]	CNPS Status[3]
Steller sea lion	*Eumetopias jubatus*	FT		
Townsend's western big-eared bat	*Corynorhinus townsendii townsendii*		CSC	
Yuma myotis	*Myotis yumanensis*		CSC	
Reptiles and Amphibians				
California horned lizard	*Phrynosoma coronatum frontale*		CSC, FP	
California red-legged frog	*Rana aurora draytonii*	FT	CSC	
Green sea turtle	*Chelonia mydas*	FT		
Hawksbill sea turtle	*Etremochelys imtricata*	FE		
Leatherback sea turtle	*Dermochelys coriacea*	FE		
Loggerhead sea turtle	*Caretta caretta*	FT		
Olive ridley sea turtle	*Lepidochelys olivacea*	FT		
Silvery legless lizard	*Anniella pulchra pulchra*		CSC	
Southwestern pond turtle	*Clemmys marmorata pallida*		CSC, FP	
Two-striped garter snake	*Thamnophis hammondii*		CSC	

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Notes:

1 - Federal Status:
FE - Federally listed Endangered
FT - Federally listed Threatened
FPE - Federally proposed (Endangered)
FPT - Federally proposed (Threatened)
FC - Federal candidate
FD - Federally delisted
FPD - Federally proposed to be delisted

2 - State Status:
SE - State listed as endangered
ST - State listed as threatened
SR - State listed as rare
SCE - State candidate for listing as Endangered
SCT - State candidate for listing as Threatened
CSC - California Department of Fish and Game species of special concern
FP - California Department of Fish and Game fully protected species

3 - California Native Plant Society (CNPS) List:
1A - Presumed extinct in California
1B - Rare or Endangered in California and elsewhere
2 - Rare or Endangered in California, more common elsewhere
3 - Plants for which we need more information - Review list
4 - Plants of limited distribution - Watch list

California red-legged frog **(Rana aurora draytonii)**

California red-legged frogs are found mostly along the central coast of California. More specifically, California red-legged frogs are found throughout Santa Barbara County in streams, ponds, lakes, and reservoirs, with the exception of the Cuyama Valley. In a study performed in 1996 (Christopher 1997), California red-legged frogs were found at Vandenberg AFB in almost every pond with summer water depth greater than 0.6 meter (2.0 feet). California red-legged frogs were found in Jalama Creek, Canada Honda Creek, and the SLC-6 sanitary evaporation ponds. Surveys conducted in 1995 at Bear Creek found no California red-legged frogs present; however, more recent surveys in August 1999 found California red-legged frogs present in the pond at Bear Valley and potential habitat was found in three other areas within Bear Creek (Christopher 1999). The shortest distance from SLC-3 launch facilities to the riparian vegetation in Bear Creek is approximately 325 meters (1,066 feet).

Brown pelican **(Pelacanus occidentalis)**

Brown pelicans are known to nest on the Channel Islands, but have not nested north of the Channel Islands since the species' decline in the late 1950s and early 1960s. Currently, brown pelicans do not nest on or in the vicinity of Vandenberg AFB. However, brown pelicans are found year-round on the coastal waters of Vandenberg AFB. The boat dock area was listed, in addition to the four natural points off Vandenberg AFB, as having higher proportions of roosting brown pelicans than other sites frequented by the pelicans, such as river mouths and beaches, due to the minimal human disturbance encountered at these sites. California brown pelicans roost at the following locations along south Vandenberg AFB coastline: Point Pedernales, Destroyer Rock, Point Arguello, Rocky Point, and the Boathouse Breakwater (Collier *et al.* 2002; Jaques and Anderson 1987).

Western snowy plover **(Charadrius alexandrinus nivosus)**

The western snowy plover nests from 1 March to 30 September on approximately 12.5 miles of Vandenberg AFB coastal sand beaches and adjacent dunes. This area provides important nesting and wintering habitat for western snowy plovers. Observations of individuals, identifiable by color bands, at specific times of year indicate that Vandenberg AFB is used in the winter by western snowy plovers that breed elsewhere. The western snowy plover also nests on San Miguel and Santa Rosa Islands.

Three geographically separate beach and dune complexes, informally named "South," "Purisima," and "North" beaches, were recognized as snowy plover breeding areas at Vandenberg AFB in annual monitoring reports (SRS Technologies 2002). The "South Beaches" consist of 4.8 miles of continuous sand beach and low dunes that extend from the rocky headlands at the north end of Wall Beach (north of the Santa Ynez River mouth) to the rock cliffs jutting into the ocean at the south end of Surf Beach. Parts of the South Beaches are open to the public and include Ocean Beach County Park and Surf Station Beach which are used for recreation. The South Beaches consist of three sectors, from north to south: Wall Beach, Surf North, and Surf South. During the breeding season for the snowy plover from March 1 through September 30 most of the beach within these three sectors is closed to recreational use to protect the species from disturbance and/or mortality. The exceptions include the northernmost 0.25 mile of Wall Beach and Surf Station Beach, which are open from 8:00 a.m. to 6:00 p.m. from April 5 to September 30 on Fridays through Mondays.

In 2002, there was a basewide nest failure of 53 percent. The primary cause of nest failure was attributable to predation, which accounted for 48 percent of nest failures, while loss to high surf accounted for another 22 percent. Nest failures can also occur due to nest abandonment caused by recreational activities and other disturbances.

California least tern **(Sterna antillarum browni)**

The nesting colonies of the California least tern in Santa Barbara and San Luis Obispo Counties are a relatively small portion of the total statewide population. However, they represent the only currently active breeding areas between Ventura County and San Francisco Bay. Monitoring efforts on Vandenberg AFB have identified a California least tern nesting colony consistently located at Purisima Point, with satellite colonies that tend to vary from year to year in their number of nest attempts and often are not active at all. California least terns nest from mid-April to August in sand dunes on North Vandenberg AFB and forage in the lagoons formed at the mouths of the Santa Ynez River and San Antonio Creek, at the small bay at Purisima Point, and at other near-shore locations at Vandenberg AFB. The Santa Ynez River lagoon is used by California least terns prior to post-breeding dispersal.

Southwestern willow flycatcher **(Empidonax traillii extimus)**

Southwestern willow flycatchers were found during the 1995 breeding season along portions of the Santa Ynez River near the 13th Street bridge and the Miguelito Channel at the 35th Street bridge site, and have been recorded nesting at the latter site (Holmgren and Collins 1995). Thus, southwestern willow flycatchers breed along the Santa Ynez River but do not nest in South Vandenberg AFB, although Bear Creek provides suitable habitat for this species.

Southern sea otter **(Enhydra lutris nereis)**

The entire coastline under Vandenberg AFB's control is used by southern sea otters feeding in offshore kelp beds. A resident breeding colony of southern sea otters exists off Purisima Point near SLC-2. Larger populations are found primarily north of the base with an increase in sightings of southern sea otters along Vandenberg AFB, with a large group having recently been found south of Point Conception. Southern sea otters have been observed fairly regularly during the late winter and spring at the Boathouse, located on Vandenberg AFB south of Point Arguello.

Other Marine Mammals

The coastal waters encompassing south Vandenberg AFB and the northern Channel Islands support diverse marine mammal assemblages. In addition to the sea otter, six species of pinnipeds (seals), and more than 25 species of cetaceans (whales) inhabit the region either as residents or transients. The Marine Mammal Protection Act of 1972 protects all marine mammals inhabiting the area underneath the flight trajectory of the launch vehicles (Figure 3-5) (see Section 3.3.2.3). In addition, the Guadalupe fur seal and Steller sea lion are federally listed as threatened, and the blue whale, finback whale, humpback whale, right whale, sei whale, and sperm whale are all federally listed as endangered (see Table 3-3).

Sea Turtles

Five species of sea turtles have been reported in the offshore southern California region. Four of these are members of the family Cheloniidae while one is the only living member of the family Dermochelidae. The chelonids include the green sea turtle (*Chelonia mydas*), the hawksbill sea turtle (*Etremochelys imbricata*), the loggerhead sea turtle (*Caretta caretta*), and the olive Ridley sea turtle (*Lepodochelys olivacea*). The only dermochelid is the leatherback sea turtle (*Dermochelys coriacea*).

The normal range of the leatherback sea turtle extends from Chile northward to Alaska. The leatherback sea turtle is the species most commonly seen off the coast of California. The normal range of the other

species does not extend north of Baja California, but individuals have been sighted or caught further north.

None of the five sea turtles is known to nest on the west coast of America. With all five species, sporadic sightings of turtles have been made within United States waters. In general, little is known about migration routes and normal movements of sea turtles while at sea.

All sea turtles are federally listed as endangered or threatened (see Table 3-3).

3.4 CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reasons. For ease of discussion, cultural resources have been divided into prehistoric, ethnohistoric, and historic resources. Cultural resources within the area of potential effect (APE) of the proposed project (see definition below) are discussed in Section 3.4.1.

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of federal projects. These laws and regulations stipulate a process of compliance, define the responsibilities of the federal agency engaging in an 'undertaking' under 36 CFR 800.16 and prescribe the relationship among other involved agencies (e.g., the State Historic Preservation Officer and the Advisory Council on Historic Preservation). In addition to NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (especially Sections 106 and 110), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act.

3.4.1 Area of Potential Effect

The APE of the proposed project for cultural resources encompasses everything within a 60-meter buffer around the SLC-3W boundary (defined by the former fenceline). Although ground disturbance would occur only within the SLC-3W boundary, a 60-meter buffer was analyzed in the event of an on-pad mishap.

An archaeological site record and literature search was completed at the Central Coast Information Center at the University of California, Santa Barbara, and at the Environmental Management Flight, Cultural Resources Offices on Vandenberg AFB. The research included a review of the literature, archaeological base maps, and cultural resource records. Previous archaeological studies within 1.0 mile of the APE (Table 3-4) were identified during the record search. More extensive information was collected for sites and isolated artifacts within 0.25 mile of the APE (Tables 3-5 and 3-6). Maps examined at the base included the Vandenberg AFB C-1 series (46 map set), the Base Comprehensive Plan Geographic Information System (GIS), and U.S. Geological Survey (USGS) topographic maps. Electronic GIS files examined include ARCHSITE2000, ISOLATE2000, CULPOLY, CULPTS, CULROADS, and CULSTORM.

Table 3-4
Previous Cultural Resource Studies within
1.0 Mile of the Falcon Launch Vehicle Program APE

Reference (in chronological order)	Vandenberg AFB Reference Number	CCIC Reference Number
Spanne and Glassow 1974	VAFB-1974-01	---
Spanne 1974	VAFB-1974-02	V-238
Glassow *et al.* 1976	VAFB-1976-01	---
Spanne 1976	VAFB-1976-02	---
Spanne 1979	VAFB-1979-02	---
Spanne 1980	VAFB-1980-07	---
Stone and Haley 1981	VAFB-1981-06	---
Haley 1981	VAFB-1981-08	---
Neff 1982	VAFB-1982-05	V-9
Schilz *et al.* 1984	VAFB 1984-02	V-20
Greenwood and Foster 1984	VAFB-1984-12	---
Wilcoxen 1984	VAFB-1984-16	V-29
WESTEC Services Inc. 1985	VAFB-1985-03	V-27
Parsons 1986	VAFB-1986-01	---
Bergin 1987	VAFB-1987-06	---
Bergin 1988a	VAFB-1988-01	---
Environmental Solutions 1988	VAFB-1988-02	---
Bergin 1988b	VAFB-1988-03	---
Bergin 1988c	VAFB-1988-03a	---
Bergin 1988d	VAFB-1988-03b	---
Bergin 1988e	VAFB-1988-04	---
Moore *et al.* 1988a	VAFB-1988-05	E-950a
Moore *et al.* 1988b	VAFB-1988-05a	E-950b
Moore *et al.* 1988c	VAFB-1988-05b	E-950c
Ferraro *et al.* 1988a	VAFB-1988-12	---
Ferraro *et al.* 1988b	VAFB-1988-12a	---
Carbone 1988	VAFB-1988-16	---
Harmsworth Associates 1988	VAFB-1988-17	V-254
Bergin 1988f	VAFB-1988-18	---
Environmental Solutions, Inc.	VAFB-1989-07	V-188
Berry 1989	VAFB-1989-09	V-185
Bergin and King 1989	VAFB-1989-12	V-115
Bergin 1989	VAFB-1989-12a	---
Environmental Solutions, Inc.	VAFB-1989-12b	---
Environmental Solutions Inc. 1989c	VAFB-1989-12c	---
Environmental Solutions Inc. 1990	VAFB-1990-06	---
Tetra Tech, Inc. 1990	VAFB-1990-09	---

Table 3-4, Page 1 of 2

Table 3-4
Previous Cultural Resource Studies within
1.0 Mile of the Falcon Launch Vehicle Program APE (Continued)

Reference (in chronological order)	Vandenberg AFB Reference Number	CCIC Reference Number
Mann *et al.* 1993	VAFB-1993-05	V-136
Kirkish 1993	VAFB-1993-11	V-189
Gerber 1994	VAFB-1994-02	---
Petraglia and Crane 1994a	VAFB-1994-28	---
Petraglia and Crane 1994b	VAFB-1994-28a	---
Woodman *et al.* 1995	VAFB-1995-08	---
Harro *et al.* 1996	---	V-161
Harro 1997	VAFB-1997-14	---
Lebow 1997	VAFB-1997-27	---
Carbone and Mason 1998	VAFB-1998-03	
Wilcoxen Archaeological	VAFB-1998-10	---
Palmer 1999	VAFB-1999-09	---
Lebow 1999	VAFB-1999-17	---
Palmer 2000	VAFB-2000-15	---
Schmidt and Bergin 1990	VAFB-1990-18	---
Snethkamp and Munns 1991	VAFB-1991-09	V-138
York 1992	VAFB-1992–04	V-137
Tetra Tech 1993	VAFB-1993-01	---

Table 3-4, Page 2 of 2

3.4.1.1 Summary of Cultural Resource Studies in and Near the APE

Many of the archaeological sites in the general project vicinity were identified during Larry Spanne's 3-year survey of Vandenberg AFB (Benson 1969; Spanne 1970, 1974). Working under a National Park Service contract funded by the Air Force, Spanne employed a "mixed strategy" survey encompassing about 68,500 acres (Spanne 1974:2). Approximately 421 sites were recorded.

In 1981, Stone and Haley conducted an intensive survey and limited testing program within the security clear zones of six military installations, including SLC-3. The purpose was to locate, record and evaluate archaeological sites relative to the National Register and to provide mitigation alternatives that would aid in avoiding adverse affects to known sites in the course of bi-annual brush clearing around military installations. Four known sites were investigated and evaluated at SLC-3 under this study, but no previously unrecorded sites were identified and no sites were located within the APE of the FLVP .

Between 1982 and 1984, archaeological investigations of fuel breaks, firebreaks, and burn parcels were completed as part of the U.S. Air Force Fuels Management Plan. Firebreaks in the vicinity of SLC-3 were included in the study. Although a total of 29 archaeological sites were encountered and recorded during the study, no sites were located within the vicinity of SLC-3 (Neff 1982; Schiltz *et al.* 1984).

Table 3-5
Summary of Archaeological Sites within 0.25 Mile of the Falcon Launch Vehicle Program APE

Site (CA-)	NRHP Eligibility	Description
SBA-946	NE	Located on the east side of Bear Creek Canyon, CA-SBA-946 was first recorded in 1972 as the original site of the Linden School, an early pioneer school, and encompasses approximately 10,240 square meters. The site is marked by a large eucalyptus grove. Spanne noted no cultural materials when the site was recorded; however, he speculates that the site may have been destroyed. The site was revisited in 1994 during a survey associated with the SLC-3E Modification Project (Gerber 1994). Numerous fragments of corrugated metal sheeting were noted within the eucalyptus grove. No additional artifacts were observed.
SBA-2423	DI	CA-SBA-2423 is on a dune slope, just outside the existing SLC-3 security fence. It was recorded in 1991 as a low-density chipped-stone scatter, including five Monterey chert cores, one Monterey chert flake, and one possible igneous flake. The site encompasses approximately 523 square meters and was discovered during the Phase 1 surface survey for the SLC-3E Modification Project (Snethkamp and Munns 1991). In 1992, the site was tested to evaluate National Register of Historic Places eligibility. That effort, which included 15 shovel test units and three excavations units, revealed a low-density deposit of chert debitage and shellfish remains. One flaked stone tool and recent historic material were also recovered. The site was considered ineligible for the National Register due to a lack of integrity and lack of data potential (York 1992).
SBA-2424	DI	CA-SBA-2424 is within the SLC-3E launch complex. It encompasses approximately 15 square meters. The site was initially discovered by Munns and Edmondson in 1991 during a survey for the SLC-3E Modification Project (Snethkamp and Munns 1991). It was originally described as a small, low-density scatter of chipped stone, which included one Monterey chert flake, one Franciscan chert flake, one possible igneous flake, and one Monterey chert flake fragment. Site disturbance was described as extensive due to buried cables, structures, paved roads and military activities. An archaeological evaluation conducted in 1992 to assess the site's National Register eligibility included seven shovel test units and two excavation units. These yielded 12 flakes and 0.2 grams of unidentified mammal bone. Site boundaries were expanded in all directions. A significant amount of recent historic debris was also observed, including concrete, glass, asphalt and plastic. Due to poor integrity and lack of data potential, CA-SBA-2424 was deemed ineligible for the National Register (York 1992).
SBA-2426	DI	This site is northwest of SLC-3E and encompasses approximately 460 square meters. CA-SBA-2426 was recorded in 1991 as a low- to moderate-density scatter of Monterey chert debitage with two possible igneous flakes. A small concentration of cultural materials was noted near the center of the site (Snethkamp and Munns 1991). An evaluation of National Register eligibility completed in 1992 included excavation of eight shovel test units and two excavation units. That effort yielded 86 pieces of debitage, six fragments of marine shell, and eighteen fragments of unidentified mammal bone. The site was considered ineligible for the National Register due to poor integrity and lack of data potentials.
SBA-2613	NE	CA-SBA-2613 encompasses approximately 1,785 square meters on a steep hillslope outside the SLC-3E security fence. The site was recorded in 1993 as a sparse scatter of chipped stone, including five Monterey chert flakes, one Monterey chert core, and one possible quartzite hammerstone and/or mano (Gerber 1994). Various melted and twisted metal fragments were noted in and around the site's recorded boundary.

Notes:
DI - Determined ineligible for the National Register in consultation with the State Historic Preservation Officer.
NE - Not evaluated (i.e., National Register status is unknown).

Table 3-6
Summary of Isolated Artifacts within 0.25 Mile of the Falcon Launch Vehicle Program APE

Isolate (VAFB-ISO-)	Within APE?	Description
325	No	One Monterey chert secondary flake
327	Yes	One Monterey chert secondary flake
328	Yes	A large fragment of slightly weathered mussel shell nacre.
329	No	One Monterey chert secondary flake and one large, thin Monterey chert flake
331	No	Two pieces of good-quality, black chert manuports
332	No	One chert flake
333	Yes	One chert flake
334	No	Fragments of glass and barbed-wire coil
336	No	Chunks of tan-colored brick and a piece of clear glass
719	No	Secondary flake
721	No	Modified flake

A number of extensive archaeological investigations completed within the immediate SLC-3 project area are associated with the Space Shuttle Program, formally known as the Space Transportation System. WESTEC Services, Inc. surveyed 133 acres for the Space Transportation System Power Plant No. 6 natural gas pipeline in 1984 and identified 11 archaeological sites and six isolated artifacts in their study area (WESTEC Services 1985), however, none were found within the vicinity of SLC-3. Ferraro *et al.* (1988) conducted archaeological studies associated with a natural gas pipeline connecting the city of Lompoc with SLC-5, located on the northern edge of Honda Canyon. Most of the project crossed the Lompoc Mesa, encompassing Bear Creek and Spring canyons in addition to Honda Canyon. Fourteen prehistoric archaeological sites were tested to evaluate National Register eligibility, however, none were within the immediate SLC-3 vicinity.

The next major archaeological investigation in the project vicinity was associated with the Backbone Fiber-Optic Transmission System Project, which involved installation of a fiber-optic cable that would link a number of facilities on North and South Vandenberg AFB, including SLC-3 (Bergin and King 1989). Overall, 24 archaeological sites and seven isolated artifacts were identified and inventoried within or near the fiber-optic corridor and two new archaeological sites were recorded. None of these sites, however, are within the SLC-3 vicinity.

A second fiber-optic project was undertaken in 1994 for the proposed Titan Fiber Optic Transmission System. Thirteen previously identified sites within or in close proximity to the system APE were assessed to determine potential adverse effects resulting from the construction of the fiber optic line. One site within the fiber optic APE, CA-SBA-2426, is within 0.25 mile of the APE for the Falcon Launch

Vehicle Program at SLC-3W, but not within the APE. This site was investigated in 1991 during the SLC-3E Modification Project (see below) and was determined ineligible for the National Register. Based on this determination, no further investigations of CA-SBA-2426 were undertaken during the Titan fiber optic Project.

Several undertakings occurred between 1991 and 1994 for the SLC-3 Modification Project. Snethkamp and Munns (1991) report archival research and an intensive survey in the vicinity of SLC-3E. Of the 15 sites investigated, five were discovered during the survey. Archaeological evaluations of the sites identified in the SLC-3E project area and completed by Dames and Moore in 1992, included excavation of shovel test pits and excavation units to define site boundaries to determine the depth of cultural deposits and recover a sample of the cultural constituents. Three of the sites (CA-SBA-2423, -2424, and –2426) were within 0.25 mile of the Falcon Launch Vehicle Program APE but were determined ineligible for the National Register due to poor integrity and data potentials (York 1992). None of these sites are located within the APE. In 1993, Dames and Moore surveyed a pipeline corridor and associated access road for the SLC-3E Modification Project (Gerber 1994). Archival research and an intensive survey identified four previously recorded sites, three new sites, and two isolated artifacts. Two of these sites (CA-SBA-946 and –2613) are located with 0.25 mile of the Falcon Launch Vehicle Program APE, but not within the APE.

3.4.1.2 Cultural Resources within the APE

Background research identified no previously recorded cultural resources within the APE of the Falcon Launch Vehicle Program (Table 3-5). However, three previously recorded isolated artifacts fall within the APE of the Falcon Launch Vehicle Program as described in Table 3-6 (VAFB-ISO-327, -328, and –333). VAFB-ISO-333 is located within the SLC-3E portion of the launch complex. VAFB-ISO-328 and –327 are in the vicinity of the former security fence that used to occur around the western edge of SLC-3W. None of these isolated artifacts, however, are located within the SLC-3W boundary where ground disturbance would occur.

In the early 1990s, the entire SLC-3 complex, including both SLC-3W and SLC-3E, was determined eligible for the National Register by the U.S. Air Force, in consultation with the State Historic Preservation Officer. In particular, the Air Force considered SLC-3 significant because of its historic function as a launch complex. The State Historic Preservation Officer concurred, and also noted that SLC-3 may have unique and distinctive qualities that are important representations of the Cold War era.

Finally, Chumash descendants continue to use resources in the vicinity of the APE for the Falcon Launch Vehicle Program (Carucci 2002). These resources, however, are not located within the SLC-3W boundary.

3.5 AIR QUALITY

This section provides background on air quality in Santa Barbara County and site-specific information for Vandenberg AFB.

3.5.1 Lower Atmosphere

Lower atmosphere refers to air up to 3,000 feet in altitude. Air quality within the Santa Barbara Air Basin is affected by the concentrations of various pollutants in the atmosphere. The amount of pollutants in the atmosphere is influenced by the interaction of three factors: the physical characteristics of the air basin, the prevailing meteorological conditions within the air basin, and the amount of pollution emitted into the

atmosphere. The interrelationship of these three factors determines the measurable concentration of pollutants in the atmosphere.

The portion of the Santa Barbara Air Basin that would be affected by emissions from the proposed project includes Vandenberg AFB and the surrounding portions of the Santa Barbara County north of the Santa Ynez Mountains.

3.5.1.1 Regional Climate and Meteorology

The climate at Vandenberg AFB is Mediterranean, or dry summer subtropical. The weather is cool and wet from November through April and warm and dry from May through October. The Pacific Ocean, which borders Vandenberg AFB on the west and south, has a moderating effect on temperature fluctuations. The mean temperature ranges from 50 to 62 degrees Fahrenheit. Vandenberg AFB monthly temperature data for 2000, 2001, and 2002 are presented in Table 3-7.

Table 3-7
Temperature Means and Extremes
(degrees Fahrenheit)

Data	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
2000													
Highest	72	79	75	79	79	79	79	73	91	79	73	75	**77.75**
Mean Max.	61	62	62	64	63	65	68	67	71	65	63	65	**64.67**
Mean Temp.	53	54	53	55	55	58	61	60	62	59	52	54	**56.33**
Mean Min.	44	45	43	46	46	51	53	53	53	53	41	43	**47.58**
Lowest	32	36	34	39	36	41	46	48	46	45	34	36	**39.42**
2001													
Highest	79	84	72	72	75	75	77	72	84	84	77	77	**37.33**
Mean Max.	60	59	60	59	64	67	66	66	67	68	67	62	**63.75**
Mean Temp.	50	50	53	50	56	57	60	59	59	59	57	52	**55.17**
Mean Min.	40	41	46	42	49	48	53	52	51	50	48	42	**46.83**
Lowest	30	32	37	36	41	39	50	45	45	43	39	34	**39.25**
2002													
Highest	75	86	73	75	75	73	75	75	84	93	86	70	**78.33**
Mean Max.	60	68	64	64	62	65	69	66	71	68	73	64	**66.17**
Mean Temp.	50	54	53	54	54	57	60	59	61	57	60	54	**56.08**
Mean Min.	40	41	41	4	46	49	51	52	50	47	47	45	**42.75**
Lowest	30	30	34	36	36	41	45	43	45	39	39	36	**37.83**

Source: Vandenberg AFB 2003.

Average annual rainfall for Vandenberg AFB from 2000 to 2002 is 15.98 inches. Most of the rainfall occurs between November and April. There are usually 40 to 50 days per year with measurable precipitation (i.e., greater than 0.01 inch). The coastal areas, including Vandenberg AFB, experience approximately 30 days per year with 0.10 to 0.49 inch of rain and 10 to 15 days with 0.50 inch or more of rain. Vandenberg AFB monthly and seasonal precipitation data for 2000, 2001, and 2002 are presented in Table 3-8.

Table 3-8
Average Monthly and Annual Precipitation
(in inches)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	0.82	11.86	1.85	3.96	0.07	0.03	0.00	0.00	0.00	0.75	0.00	0.12	19.46
2001	4.10	5.50	3.13	0.86	0.00	0.00	0.02	0.00	0.00	0.64	2.60	1.14	17.99
2002	2.49	0.53	0.73	0.36	0.05	0.01	0.00	0.02	0	0.04	1.45	4.81	10.49

Source: Vandenberg AFB 2003.

The principal meteorological conditions that control dispersion are winds and turbulence (or mixing ability) of the atmosphere. The wind direction determines which locations would be affected by a given source. The wind speed, along with the degree of turbulence, controls the volume of air available for pollutant dilution. Atmospheric stability is a measure of the mixing ability of the atmosphere and, therefore, its ability to disperse pollutants. Greater turbulence and mixing are possible as the atmosphere becomes less stable, and thus pollutant dispersion increases. In general, stable conditions occur most frequently during the nighttime and early morning hours.

Vandenberg AFB lies within the zone of mid-latitude prevailing westerlies from approximately November to April. During the rest of the year, the semi-permanent Eastern Pacific subtropical high-pressure cell creates a northwesterly to westerly flow direction. Locally, winds are usually light during the nighttime hours, reaching speeds of approximately 12 miles per hour by the afternoon. Winds at Vandenberg AFB most often are northwesterly on North Base and north to northeasterly on South Base. The strongest winds are associated with rainy season storms. The frequency distribution tables for wind speed averages at Vandenberg AFB and at neighboring cities Lompoc and Santa Ynez are presented Appendix C.

Vandenberg AFB experiences early morning and afternoon temperature inversions about 96 and 87 percent of the time, respectively. The inversion acts as a lid and restricts the vertical dispersion of pollutants, thus increasing local pollutant concentrations. Pollutants can be "trapped" in the inversion layer until heat lifts the layer or strong surface winds disperse the pollutants.

3.5.1.2 Air Quality and Regulations

Federal Rules and Regulations

The proposed project is federally regulated by the following Titles:

- Title 40 CFR 50: National Ambient Air Quality Standards (NAAQS);

- Title 40 CFR 51: Requirements for Preparation, Adoption, and Submittal of Implementation Plans;
- Title 40 CFR 61: National Emission Standards for Hazardous Air Pollutants (NESHAP);
- Title 50 CFR 63: NESHAP for Source Categories;
- Title 40 CFR 70: State Operating Permit Program; and
- Title 49 CFR Parts 100-199: Hazardous Materials Regulation.

Each of these regulations is briefly discussed below.

Title 40 CFR 50 (NAAQS): The Clean Air Act required the U.S. Environmental Protection Agency (U.S. EPA) to establish ambient ceilings for certain criteria pollutants. Subsequently, the U.S. EPA promulgated regulations that set NAAQS. Two classes of standards were established: primary and secondary. Primary standards prescribe the maximum permissible concentration in the ambient air required to protect public health. Secondary standards specify levels of air quality required to protect public welfare, including materials, soils, vegetation, and wildlife, from any known or anticipated adverse effects. The criteria pollutants for which the NAAQS have been established include carbon monoxide, nitrogen dioxide, ozone, lead, particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide.

California has also established its own air quality standards known as the California Ambient Air Quality Standards (CAAQS). The California standards include all the pollutant criteria listed under the NAAQS except for $PM_{2.5}$. The CAAQS are generally more stringent than the NAAQS and have incorporated additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particulate matter. The NAAQS and CAAQS are presented in Table 3-9.

The U.S. EPA classifies air quality within each Air Quality Control Region with regard to its attainment of federal primary and secondary NAAQS. According to U.S. EPA guidelines, an area with air quality better than the NAAQS for a specific pollutant is designated as in attainment for that pollutant. Any area not meeting ambient air quality standards is classified as nonattainment. When there is a lack of data for the U.S. EPA to define an area, the area is designated as unclassified and treated as an attainment area until proven otherwise. Pollutant concentrations within the Santa Barbara Air Basin atmosphere are assessed relative to the federal and state ambient air quality standards.

Title 40 CFR 51 (Implementation Plan): The Santa Barbara County Air Pollution Control District is required to monitor air pollutant levels to ensure federal and state ambient air quality standards are met. If ambient air quality standards are not met, District must develop a plan to meet them. If the air quality in Santa Barbara County is better than what is established by government standards, the area is classified as an "attainment" area. If regional air quality contains pollutant levels that are in violation of these standards, the area is classified as a "nonattainment" area.

Table 3-9
National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1] Concentration[3]	National Standards[2] Primary[3,4]	National Standards[2] Secondary[3,5]
Ozone (O_3)	1-Hour	0.09 ppm (180 µg/m^3)	0.12 ppm (235 µg/m^3)[8]	Same as Primary Standard
	8-Hour	-	0.08 ppm (157µg/m^3)[8]	
Respirable particulate matter at 10 microns (PM_{10})	24-Hour	50 µg/m3	150 µg/m^3	Same as Primary Standard
	Annual Arithmetic Mean	20 µg/m^3	50µg/m^3	
Fine particulate matter at 2.5 microns ($PM_{2.5}$)	24-Hour	No Separate State Standards	65 µg/m^3	Same as Primary Standard
	Annual Arithmetic Mean	12µg/m^{3*}	15 µg/m^3	
Carbon monoxide (CO)	8-Hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	None
	1-Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	-	0.053 ppm (100 µg/m^3)	Same as Primary Standard
	1-Hour	0.25 ppm (470 µg/m^3)	-	
Sulfur dioxide (SO_2)	Annual Arithmetic Mean	-	0.03 ppm (80 µg/m^3)	-
	24-Hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	-
	3-Hour	-	-	0.5 ppm (1,300 µg/m^3)
	1-Hour	0.25 ppm (655 µg/m^3)	-	-
Lead[7]	30-Hour	1.5 µg/m3	-	-
	Quarterly	-	1.5 µg/m^3	Same as Primary Standard
Visibility reducing particles	8-Hour	Extinction coefficient of 0.23 per kilometer due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.	-	-
Sulfates	24-Hour	25 µg/m3	-	-
Hydrogen sulfide	1-Hour	0.03 ppm (42 µg/m^3)	-	-
Vinyl chloride[7]	24-Hour	0.010 ppm (26 µg/m^3)	-	-

Notes: 1 - California standards for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, PM_{10}, $PM_{2.5}$ and visibility reducing particles are not to be exceeded. The standards for sulfates, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of 17 of the California Code of Regulations.

2 - National standards other than O_3 PM2.5, PM_{10}, and those based on annual averages or annual arithmetic mean are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when 99 percent of the daily concentrations averaged over three years, are equal to or less than the standard. For PM2.5, the 24-hour standard is attained when 98 percent of the daily concentrations averaged over three years, are equal to or less than the standard.

3 – Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 250C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 - National Primary Standards: The level of air quality necessary, with an adequate margin of safety, to protect the public health.

5 - National Secondary Standards: The level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

6 – New federal 8-hour O_3 and fine particulate matter standards were promulgated by U.S. EPA on July 18, 1997.

7 – The CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

* - On June 20, 2002, the California Air Resources Board approved staff's recommendation to revise the PM_{10} annual average standard to 20 $\mu g/m^3$ and to establish an annual average standard for PM2.5 of 12 $\mu g/m^3$. These standards will take effect upon final approval by the Office of Administrative Law, which is expected in February 2003.

km = kilometer
$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million

Source: California Air Resources Board 2003

Title 40 CFR 51 Subpart W (General Conformity): General conformity rule applies to federal actions that are not covered by transportation conformity rule, with several listed exceptions. Other than the listed exemptions and presumptions of conformity, general conformity applies to actions in which projected emissions exceed applicable conformity *de minimis* thresholds. However, if the emissions from a federal action do not equal or exceed *de minimis* thresholds but do represent 10 percent or more of a nonattainment or maintenance area's total emissions of any criteria pollutant, the action is considered "regionally significant" and the requirements of conformity determination apply.

Title 40 CFR 61(NESHAP): The NESHAP regulates stationary sources with a prescribed standard under Title 40 CFR 61. Such stationary sources may be required to obtain an operating permit issued by an authorized Air Pollution Control agency or by U.S. EPA in accordance with Title V of the Clean Air Act. The NESHAP identifies and list a variety of hazardous air pollutants that are regulated.

The only section of NESHAP regulations that may apply to the proposed project is Title 40 CFR 63 Subpart GG for manufacturers of commercial, civil, or military aerospace vehicles or components and that are major sources of hazardous air emissions. Such emissions would result from cleaning operations, surface coating with primers and topcoats, paint removal, and waste storage.

Hazardous wastes that are subject to Resource Conservation and Recovery requirements would be exempt from the subpart (see Section 3.6, Hazardous Materials/Hazardous Waste). Those wastes would include specialty coatings, adhesives, primers, and sealant materials at aerospace facilities. Other exemptions would include hazardous air pollutants or volatile organic compound (VOC) contents less than 0.1 percent for carcinogens or 1.0 percent for non-carcinogens and low volume coatings.

Title 40 CFR 70 (State Operating Permit Programs): In accordance with Title V of the Clean Air Act large facilities that are capable of producing large amounts of air pollution are required to obtain an operating permit. Permits in California are issued by the local Air Pollution Control District. Typical activities that require the Title V permit include any major source (source that emits more than 100 tons per year of criteria pollutant in a nonattainment area for that pollutant or is otherwise defined in Title I of Clean Air Act as a major source); affected sources as defined in Title IV of Clean Air Act; sources subject to Section 111 regarding New Source Performance Standards; sources of air toxics regulated under Section 112 of Clean Air Act; sources required to have new source or modification permits under Parts C or D of Title I of Clean Air Act; and any other source such as hazardous waste pollutants designated by U.S. EPA regulations.

Part 70 Federal Operating Permits are issued to specific emission sources. Sources requiring permits are determined based on the source's potential to emit certain threshold levels of pollution given their equipment and processes. Facilities requiring Part 70 Federal Operating Permits include sources with the potential to emit the following:

- Regulated air pollutant or hazardous air pollutant (HAP) amounts equal or greater than:
  - 100 tons/year of any regulated air pollutant;
  - 10 tons/year of any individual HAP or 25 tons/year of a combination of HAPs; or
  - Lesser quantity thresholds for any HAP established by the U.S. EPA rulemaking.
- Any stationary source defined by the U.S. EPA as major for the District under Title I, Part D (Plans for Nonattainment Areas) of the Clean Air Act and its implementing regulations including:
  a. For ozone nonattainment areas, sources with the potential to emit 100 tons per year or more of volatile organic compounds or oxides of nitrogen in areas classified as "marginal" or "moderate," 50 tons per year or more in areas classified as "serious," 25 tons per year or more in areas classified as "severe," and 10 tons per year or more in areas classified as "extreme";
- Acid rain sources included under the provisions of Title IV and its implementing regulations.
- Any source required to have a pre-construction review permit pursuant to the requirements of the New Source Review/Prevention of Significant Deterioration program under Title I, Parts C and D and its implementing regulations;
- Any solid waste incineration unit required to obtain a Part 70 permit pursuant to Section 129(e) of the Clean Air Act and its implementing regulations; and
- Any stationary source in a source category required to obtain a Part 70 permit pursuant to regulations promulgated by the U.S. EPA Administrator.

Companies may decide to make equipment or process changes to avoid the federal Part 70 permitting process. Federal rules application depends on the air quality of a specific area and the threshold levels that are set. Santa Barbara County was formerly classified as serious

nonattainment for the ozone federal standard. However, Santa Barbara County recently obtained attainment of the federal standard. On 16 June 2003, U.S. EPA signed the final rulemaking that officially states that Santa Barbara County is in attainment of the federal one-hour ozone standard. Reclassification allows increment in Part 70 threshold levels and a reduction in the number of county sources requiring federal permits.

Title 49 CFR Parts 100-199: Liquid propellant for the Falcon launch vehicle must be shipped and handled in accordance with Title 49 CFR Parts 100-199. The liquid propellants would be shipped directly from the manufacturing location to the launch site.

Local Rules and Regulations

The Falcon Launch Vehicle Program would apply for a stationary source designation. The Falcon Launch Vehicle Program may be subject to the requirements of District's Regulation VIII, *New Source Review*. This process could trigger a requirement to implement best available control technology or emission offsets, an air quality impact analysis, pre-construction monitoring, and/or visibility to determine the net effect of the proposed activity. The requirement could also trigger the necessity to conduct an analysis of the proposed project under the California Environmental Quality Act.

In addition to the federal requirements mentioned above, the proposed project would be subject to the District rules and regulations listed in Table 3-10. Under these rules and regulations, all stationary and portable source equipment, painting (for aerospace and industrial) activities, and any solvent wipe and flush operations would require an Authority to Construct and Permit to Operate from the District prior to implementing refurbishment or operational activities, unless exempted by Rule 202.

Finally, operation of the salvage ship to recover the first stage of the Falcon vehicle would require a permit for the use of this vessel in the California coastal waters when in the South Central Coast Air Basin, South Coast Air Basin, and San Diego Air Basin areas; the number and types of permits and permit requirements would depend on where the salvage ship is used.

3.5.1.3 Regional Air Quality

Ozone Nonattainment

Santa Barbara County is in attainment for all standards except the state ozone and the state PM_{10} standards. Santa Barbara County was formerly classified as serious nonattainment for the ozone federal standard. However, Santa Barbara County recently obtained attainment of the federal standard. On 16 June 2003, U.S. EPA signed the final rulemaking that officially states that Santa Barbara County is in attainment of the federal one-hour ozone standard. The following text addresses the Santa Barbara County's air quality nonattainment of state standards for these two pollutants and the environmental and source factors contributing to this nonattainment status.

Ozone is not produced directly by any pollutant source. Instead, it is formed by a reaction between nitrogen oxides and reactive organic compounds in the presence of sunlight. A reduction in ozone is dependent on a reduction in nitrogen oxides and reactive organic compound emissions. Reduction of these pollutants has the added benefit of reducing the concentration of entrained PM_{10} emissions. Reduction of PM_{10} emissions is important because Santa Barbara County is currently in violation of the state standard for PM_{10}.

Table 3-10
Santa Barbara County Air Pollution Control District Air Quality Compliance Rules

Regulation I	Rule 101	Compliance by Existing Installations: Conflicts
	Rule 201	Permits Required
	Rule 202	Exemptions to Rule 201
	Rule 205	Standards for Granting Applications
	Rule 206	Conditional Approval of Authority to Construct or Permit to Operate
Regulation II	Rule 210	Fees
Regulation III	Rule 301	Circumvention
	Rule 302	Visible Emissions
	Rule 303	Nuisance
	Rule 304	Particulate Matter – Northern Zone
	Rule 309	Specific Contaminants
	Rule 311	Sulfur Content of Fuels
	Rule 322.	Metal Surface Coating Thinner and Reducer
	Rule 323.	Architectural Coatings
	Rule 324.	Disposal and Evaporation of Solvents
	Rule 326.	Storage of Reactive Organic Compound Liquids
	Rule 330	Surface Coating of Metal Parts and Products
	Rule 331.	Fugitive Emissions Inspection and Maintenance
	Rule 333	Control of Emissions from Reciprocating Internal Combustion Engines
	Rule 337	Surface Coating of Aircraft or Aerospace Vehicle Parts and Products
	Rule 342	Control of Oxides of Nitrogen from Boilers, Steam Generators and Process Heaters
	Rule 346	Loading of Organic Liquid Cargo Vessels
	Rule 353	Adhesives and Sealants
	Rule 360.	Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers
Regulation VII	Rule 702	General Conformity[1]
Regulation VIII	Rule 801-808	New Source Review
Regulation IX	Rule 901-903	New Source Performance Standards
Regulation X	Rule 1001	National Emission Standards for Hazardous Air Pollutants
Regulation XIII	Rule 1301-1305	Part 70 Operating Permit Program
	Rule 1303	Permits

Note: 1 - General Conformity is addressed within this EA.

Ozone concentrations are generally highest during the summer months and coincide with atmospheric inversions. At their maximum, ozone concentrations tend to be regionally distributed. This is due to the homogeneous dispersion of the precursor emissions in the atmosphere. Hence, when an inversion occurs, the mixing of the precursor pollutants is within a much smaller volume of air. In 2002, Santa Barbara County reported zero days during which the 1-hour federal standard was exceeded and three days during

which the 8-hour NAAQS standard was exceeded at various monitoring stations throughout the county. The more stringent CAAQS one-hour standard was exceeded on 3 days.

Santa Barbara County's air quality historically violated both CAAQS and NAAQS for ozone. The severity of the ozone violation for the County is currently classified as "moderate" by state government. The degree to which Santa Barbara County is in nonattainment for ozone is dependent on the "design value" concentration. The design value represents the fourth highest 1-hour observed concentration during a 3-year period at any individual monitoring station.

Santa Barbara County attained the federal 1-hour ozone standard by averaging no more than one exceedance of the standard per year at any monitoring station for three consecutive years.

PM_{10} Nonattainment

Particulate matter 10 microns or less in diameter is produced either by direct emission of particulates from a source or by formation of aerosols as a result of chemical reactions in the atmosphere involving precursor pollutants. The sources of PM_{10} can also be categorized as natural (geogenic) or resulting from human activity (anthropogenic). The largest source of PM_{10} emissions in the county is entrained paved road dust. Other sources of PM_{10} emissions include dust from construction and demolition, agricultural activities, entrained road dust from unpaved roads, natural dust, and particulate matter released during combustion.

As previously mentioned, Santa Barbara County exceeds CAAQS for PM_{10}. Exceedances of the annual standard predominantly occur at the Paradise Road monitoring station. Exceedances of the 24-hour standard are more widespread across the county, although they do not occur as frequently.

Baseline Air Quality

Under the 1990 Clean Air Act amendments, the County of Santa Barbara was classified as moderate nonattainment and was required to submit a plan in 1994 to show attainment of the federal ozone standard by 1996. The area underwent violations of the standard after submission of the plan in 1994. As a result the area was reclassified from moderate to serious nonattainment and was required to submit a new plan to demonstrate attainment by November 15, 1999. The new plan was submitted in 1998 and approved in 2000. It demonstrated attainment of the federal ozone standard by the end of 1999 and became the federally enforceable ozone plan for the Santa Barbara County.

The Clean Air Plan is a multi-faceted air quality document that takes into consideration the Rate of Progress Plan, and a maintenance plan to show that the federal ozone standard will continue to be attained. The District has developed the 1998 Clean Air Plan, which was approved in 2000 by the U.S. EPA. Therefore, for the purpose of the proposed project, project emissions are compared to the 1998 Clean Air Plan, which documents the District 1996 annual emission inventory and control strategies to assess short-term and cumulative impacts for Vandenberg AFB construction projects.

3.5.1.4 Pollutant Emissions from the Proposed Project

The pollutant emitting activities, sources of emissions, and resulting pollutants that would occur under the proposed project are listed in Table 3-11.

Table 3-11
Proposed Action Emission Activities, Sources, and Potential Pollutants from Emission Activities

Emission Activity	Source	Potential Pollutant
Construction	Excavation; Compact and backfill; and Concrete use.	Nitrogen oxides, sulfur oxides, PM_{10}, carbon monoxide, reactive organic compounds
Mobile Source[1]	Construction vehicles	Nitrogen oxides, sulfur oxides, PM_{10}, carbon monoxide, reactive organic compounds
Site Preparation[2] (Fugitive Dust)	Workers' vehicles; Construction vehicles; Wind erosion; and Dirt piling or material handling.	PM_{10}
Operation	Personnel motor vehicles Falcon launches, preparation, assembly, and fueling; and Point and stationary sources.	Nitrogen oxides, sulfur oxides, PM_{10}, carbon monoxide, reactive organic compounds

Notes: 1 - Emissions from mobile sources included exhaust emissions from mobile equipment and motor vehicles during construction and site preparation. Marine vessel for launch recovery will not return to Santa Barbara County.
2 - Emissions from site preparation are resulted from entrained vehicle emissions, wind erosion, dirt piling, and material handling.

3.5.2 Upper Atmosphere

The atmosphere above 3,000 feet from the earth surface is divided into the lower troposphere, the upper troposphere and the stratosphere. The lower troposphere layer comprises from 3,000 feet to 10,000 feet altitude. The upper troposphere layer begins at 10,000 feet and extends to 49,000 feet. From 49,000 feet to 16,400 feet the troposphere layer is defined. The lower troposphere experiences removal of most rocket emissions within approximately one week. The removal of the emissions takes place during rainfall and by vertical air movement that draws the emissions to the ground.

3.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE

3.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used to support the various missions and general maintenance operations at Vandenberg AFB. Vandenberg AFB requires all contractors or commercial entities using hazardous materials on Vandenberg AFB to submit a Hazardous Materials Contingency Plan prior to working on base. All hazardous materials would be handled and disposed per the requirements established by EWR-127-1, Section 3.10 (Hazardous Materials) and Section 6.10 (Hazardous Materials Operations) and identified in the Space X Hazardous Material Contingency Plan for the Falcon Launch Vehicle Program. In addition, any hypergolic propellants used at Vandenberg AFB must be controlled by United Paradyne, which handles the purchase, transport, temporary storage, and loading of hypergolic fuels and oxidizers. All hypergolics at Vandenberg AFB are stored at the Hypergolic Fuels Storage Facility (Buildings 974 and 975) on South Vandenberg AFB.

Space X would also be responsible for completing a California Business Plan for the storage of LOX, RP-1, liquid nitrogen, and gaseous helium at SLC-3W. In general, a California Business Plan is required to identify hazardous materials stored onsite that exceed 55 gallons for liquids, 500 pounds for solids, or 200 cubic feet for compressed gases; or the federal thresholds for extremely hazardous substances. The business plan must be submitted to the local California Unified Program Agency. The Santa Barbara County Fire Department is the local designated Agency for the central California coast.

In addition to a California Business Plan, Space X would also prepare a Spill Prevention Control and Countermeasures Plan pursuant to state and federal regulations for the aboveground storage tanks (ASTs) for LOX, RP-1, liquid nitrogen, and gaseous helium. Finally, Space X would register the AST for RP-1 with the State Water Resources Control Board (SWRCB) pursuant to the state's Aboveground Storage Tank Program for petroleum storage tanks.

In the event of a spill of hazardous materials, the Air Force would provide initial emergency spill response; however, the remainder of emergency/corrective actions would be the responsibility of Space X. Space X is responsible for preparing its own Emergency Response Plan for the Falcon Launch Vehicle Program in accordance with the Vandenberg AFB Hazardous Materials Emergency Response Plan. The Vandenberg AFB Hazardous Materials Emergency Response Plan ensures that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed by all installation personnel and commercial entities. In the event of a spill, Space X would also be responsible for completing a Community Awareness and Emergency Response (CAER) reporting form per local Santa Barbara County hazardous material and hazardous waste spill reporting requirements.

3.6.2 Hazardous Waste Management

Federal and state regulations, such as the Resource Conservation and Recovery Act (40 CFR 260–279) and the California Health and Safety Code (Chapter 6.5 of Division 20), designate certain wastes as hazardous and prescribe standards, procedures, and documentation for handling, transporting, treating, and disposing of hazardous wastes properly. The California Environmental Protection Agency, Department of Toxic Substances Control is responsible for enforcing these regulations in California and at Vandenberg AFB.

Vandenberg AFB published and approved detailed rules for implementing hazardous waste regulations in its Hazardous Waste Management Plan (U.S. Air Force 2002b). The Hazardous Waste Management Plan outlines the procedures for disposing of hazardous waste to ensure the proper identification, management, and disposition of hazardous waste on Vandenberg AFB.

Space X would be responsible for developing its own Hazardous Waste Management Plan for the Falcon Launch Vehicle Program in accordance with the Vandenberg AFB Hazardous Waste Management Plan, to document how Space X would control hazardous wastes for the program. In addition, all hazardous waste must be handled and disposed per the requirements established by EWR-127-1, Section 3.10 (Hazardous Materials) and Section 6.10 (Hazardous Materials Operations).

3.6.3 Installation Restoration Program

The Installation Restoration Program (IRP) is an Air Force program that identifies, characterizes, and remediates past environmental contamination on Air Force installations. The program has established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment. In response to the Comprehensive Environmental

Response, Compensation and Liability Act (CERCLA) and requirements of Section 211 of the Superfund Amendments and Reauthorization Act (SARA), DoD established the Defense Environmental Restoration Program (DERP) to facilitate clean up of past hazardous waste disposal and spill sites nationwide. Section 105 of SARA mandates that response actions follow the National Oil and Hazardous Substances Pollution Contingency Plan, as promulgated by the U.S. EPA. AFI 32-7020, Environmental Restoration Program, implements the DERP as outlined in DoD Manual 500.52-M, Environmental Restoration Program Manual.

The IRP sites at Vandenberg AFB are being addressed in a manner generally consistent with the CERCLA process. IRP Site 6 occurs at SLC-3W (Figure 3-6). Hazardous substances that may have been released in the past include RP-1, unsymmetrical dimethylhydrazine, component flushing solvents (trichloroethylene [TCE], methylene chloride, and isopropyl alcohol), diesel fuel, waste oil, trace metals in deluge water, and paint residue in sandblast grit.

In 1990, initial soil sampling was conducted at the site, and follow-up sampling was conducted in 1992. Based on these sampling results and results from recent soil sampling conducted during remedial investigations at IRP Site 6 (unpublished data 2002), no soil contamination was found at IRP Site 6.

Groundwater, at depths of 200 to 300 feet below ground surface, is contaminated with TCE below SLC-3E and SLC-3W, however, due to the depth of groundwater below SLC-3W, SLC-3W is not the likely source of the TCE contamination. No further action is planned for soils at Site 6.

Installation Restoration Program Site 5 is located at SLC-3E. IRP Site 7 (Bear Creek Pond) is located west of SLC-3W. The pond area is located at the terminus of Bear Creek just east of Coast Road. At SLC-3E and SLC-3W, deluge water was released in the past to Bear Creek Canyon. Contaminants of concern detected in soils at Bear Creek Pond include, solvents, phenols, and metals.

Two areas of concern (AOCs) associated with the SLC-3 area were identified during the Preliminary Assessment/Site Investigation. AOC-66 is located at Building 765, a missile/space research facility with a substation and a transformer with detectable levels of polychlorinated biphenyls (PCBs). AOC-91, a 55-gallon waste oil drum was associated with Building 780, the Water Pump House; the drum was removed under a compliance removal action. Both of these AOCs are outside the boundaries of SLC-3W.

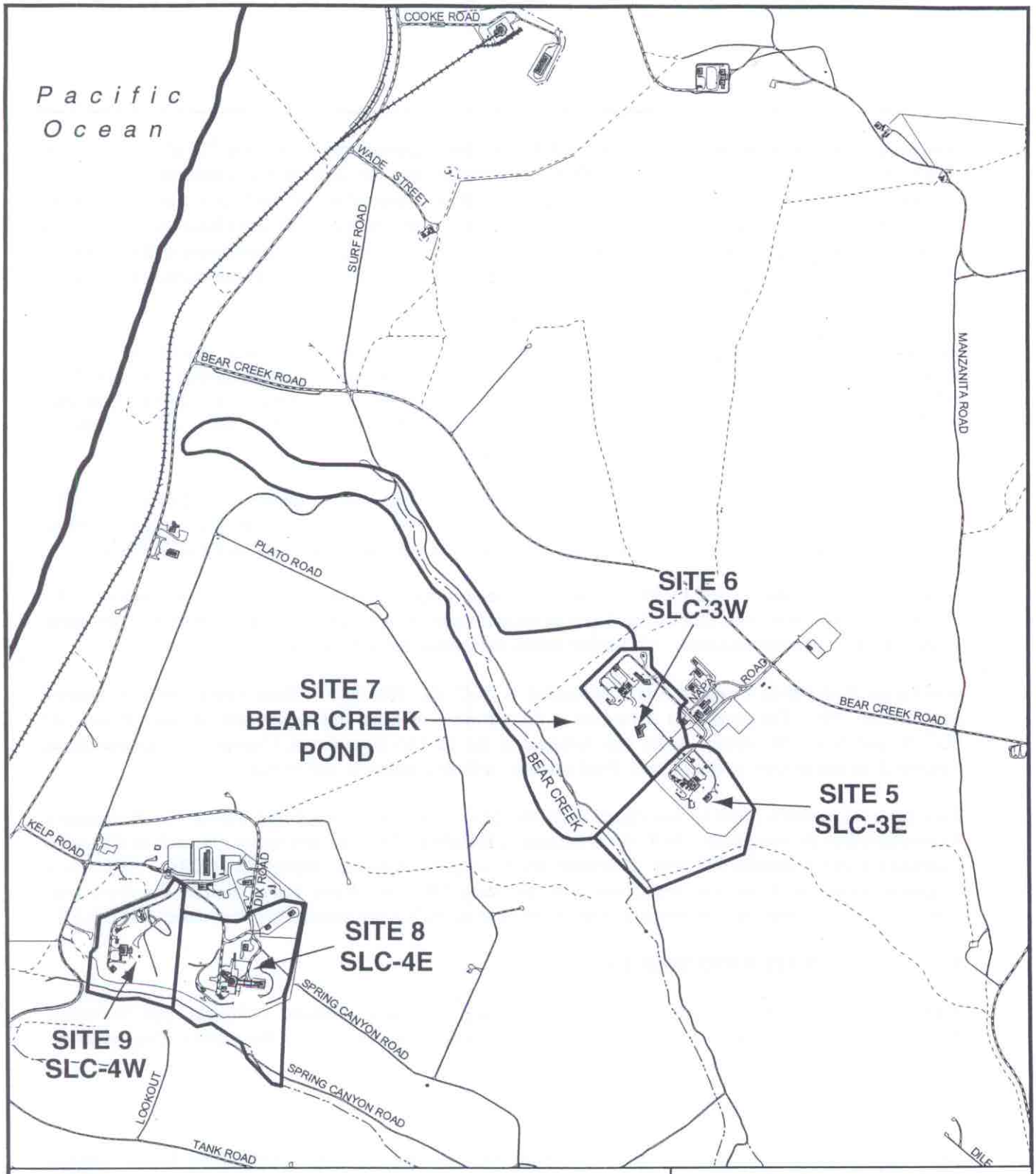
3.7 WATER RESOURCES

Water resources include groundwater and surface water and their physical, chemical, and biological characteristics. Water supply and wastewater management is also discussed in this section along with the presence of jurisdictional waters of the United States (see below).

3.7.1 Surface Water

Four major drainages occur on South Vandenberg AFB: Cañada Tortuga Creek, Bear Creek, Cañada Honda Creek, and Jalama Creek. There are numerous unnamed minor drainage basins containing seasonal and ephemeral streams. Drainage from these basins is predominantly to the west, toward the Pacific Ocean.

The Santa Ynez River forms the geomorphic boundary between North and South Vandenberg AFB. The major drainage for South Vandenberg AFB is Cañada Honda Creek, with a watershed of about 12 square miles. Springs associated with the Cañada Honda Fault usually issue a minimal flow of water to the watershed. There are no permanent lakes, impoundment, rivers, or floodplains on South Vandenberg AFB;



LEGEND

- Railroad
- Street
- Building
- Stream
- IRP Site Boundary

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

IRP SITES AT AND
ADJACENT TO SLC-3W

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	2/6/03	RANDALL	VAFB GIS	g:/commercial/1295-03 XSPACE/3-6 IRP Sites.ai	3-6

however, there are several streams that drain directly into the ocean. Jalama Creek is near the outside of the southern border of the base.

There are no permanent surface water bodies at SLC-3W and SLC-3W is not located within a 100-year floodplain. An intermittent drainage occurs at the southeast corner of the site, at the foot of the existing deluge water system retention basin, and drains toward Bear Creek Canyon (Figure 2-3). The drainage has a defined bed and bank with willows growing on the banks. Therefore, this drainage would be considered jurisdictional waters of the United States (see Section 3.7.1.1, Jurisdictional Waters of the United States).

Bear Creek is located within Bear Creek Canyon, under the range of the Falcon Launch Vehicle Program and approximately 325 meters (1,066 feet) south of SLC-3. Bear Creek is lined with riparian woodland and leads to Bear Creek Pond, which is located east of Coast Road. Bear Creek is considered jurisdictional waters of the United States with jurisdictional wetlands located adjacent to the creek as well.

3.7.1.1 Jurisdictional Waters of the United States

The U.S. Army Corps of Engineers is responsible for determining jurisdictional boundaries of waters of the United States and wetlands for regulatory and permitting purposes under Section 404 of the Clean Water Act. The jurisdictional limit of waters of the United States is identified by the extent of the ordinary high water mark. For delineating wetlands, the Corps of Engineers has developed a field method using a "three parameter test" that considers hydrophytic vegetation, wetland hydrology, and hydric soils. Under the Corps of Engineers definition, an area is considered a wetland only if indicators of all three parameters are present, except for wetland types designed as "problem areas" or conditions considered to be significantly disturbed or "atypical" (Environmental Laboratory 1987).

Section 404 of the Clean Water Act requires a permit from the Corps of Engineers in order to locate a structure, excavate, or discharge dredged or fill material into waters of the United States or wetlands. Similarly, such activities would also be subject to the requirements of Section 401, which that requires a Water Quality Certification or Waiver from the Regional Water Quality Control Board.

The intermittent drainage leading from the foot of the deluge water retention basin to Bear Creek Canyon at SLC-3W would be considered jurisdictional waters of the United States protected under Sections 404 and 401 (Figure 2-3). Bear Creek, located in Bear Creek Canyon and under the range of the Falcon Launch Vehicle Program, is also considered jurisdictional waters of the United States and wetlands and is protected under Sections 404 and 401.

3.7.1.2 Surface Water Quality

The U.S. EPA is the lead office responsible for administration of the Clean Water Act or federal Water Pollution Control Act, which addresses water pollution issues through a system of permitting designed to control, and eventually eliminate water pollution. The principal federal regulatory mechanism is the NPDES permit.

The Clean Water Act provides for complete delegation of authority to states once the U.S. EPA administrator approves the state program. In California, this authority has been delegated to the State Water Resources Control Board and its Regional Water Quality Control Board. The Army Corps of Engineers enforces Section 404 of the Clean Water Act (see Section 3.7.1.1). The federal system of

increasingly more stringent discharge limitations is, for the most part, irrelevant in California due to more stringent water quality standards developed under state law.

The current era of California state water quality and pollution control began with the Porter-Cologne Water Quality Control Act of 1969. This Act established a comprehensive program for both regulating water quality and controlling sources of pollution. Organizations responsible for implementing the state program include the State Water Resources Board and the nine Regional Water Quality Control Boards. Nearly all wastewater management practices and activities on Vandenberg AFB fall under the jurisdiction of the Central Coast Regional Water Quality Control Board (CCRWQCB) located in San Luis Obispo, California.

Locally, the powers and responsibilities of the CCRWQCB include implementing a Central Coast Basin Water Quality Control Plan or Basin Plan in an effort to meet statutory and state board requirements and provisions of the federal Clean Water Act. Basin Plans are developed to establish and protect current and future "beneficial uses" of water through implementation of water quality objectives. Implementation of water quality objectives is accomplished through planning activities, surveillance and enforcement, and by regulating discharges through permitting. The CCRWQCB is authorized to regulate any discharges of wastes that may affect the quality of state waters. Based upon the increasingly stringent interpretation of the term "waste" (which may be more limiting than drinking water standards), wastewater discharges that do not meet regional water quality objectives will be regulated through a waste discharge requirement (WDR). Such discharges are regulated regardless of whether they are made directly into state waters or onto land that may affect groundwater.

In all, a WDR is imposed by the CCRWQCB upon any person who discharges or proposes to discharge a waste or a wastewater that has the potential to alter the quality of the receiving waters. Once the report of waste discharge or proposed discharge is made, the discharger may take no further action until a WDR is issued. At Vandenberg AFB, proposals for wastewater discharge must be coordinated through the 30 CES/CEVC.

Several other statewide or regional General Permits are in place to regulate typical types of waste discharges. The Statewide NPDES General Permit for Discharges of Storm Water Associated with Construction Activities would apply to the Falcon Launch Vehicle Program.

Storm water discharges associated with construction projects are required to comply with state regulations under the Statewide NPDES General Permit for Storm Water Discharges Associated with Construction Activities. The current permit covers Phase I of the NPDES Storm Water Program addressing discharges from large construction activities disturbing 5 acres or more of land. In determining the requirements for coverage, a construction activity area must be measured to include all disturbed areas, including those that may not be continuous. As of the date of this EA, the State Water Resources Control Board is updating the existing general permit for construction activities to also include small construction sites between 1 and 5 acres, but is not on schedule to meet its 10 March 2003 deadline.

3.7.2 Groundwater

Groundwater at SLC-3W is located at 200 feet bgs according to 2002 records from three groundwater monitoring wells installed at the SLC-3 complex (6-MW-3, 5-MW-14, and 5-MW-15) during recent remedial investigations (unpublished data 2002) for the Installation Restoration Program at Vandenberg AFB. Groundwater in the region historically was used for potable water, however, it is no longer used due to the availability of State Water (see Section 3.7.3, Water Supply).

3.7.3 Water Supply

Historically, the potable water supply for Vandenberg AFB was obtained solely from groundwater sources. Since 1997, Vandenberg AFB has received potable water from the State Water Project, which does not draw from local aquifers. Vandenberg AFB can purchase up to 1.46 billion gallons of water per year from the State Water Project.

In 2001, the total potable drinking water consumption at Vandenberg AFB was 328.6 million gallons. At SLC-3E, a total of approximately 5.1 million gallons (or approximately 15.6 acre-feet) of potable water is required for six Atlas IIAS launches per year (Versar, Inc. 1991).

3.7.4 Domestic Wastewater Management

All sanitary waste generated at SLC-3 flows via underground sanitary sewer pipes to a 5,000-gallon septic tank and leach field system located approximately 725 feet north-east of the SLC-3W pad (Tetra Tech 2002) (see Figure 2-3). The septic tank design flow rate is 4,500 gallons per day (E&E 2000) based upon flow measurements collected in July 2000.

3.7.5 Industrial or Hazardous Wastewater Management

Wastewater generated during operation of the launch deluge water system for the Falcon Launch Vehicle would be contained in the retention basin, characterized as either hazardous or non-hazardous, and removed and hauled to an approved off-base disposal facility. Operation and construction of the launch deluge water system would also be in compliance with EWR 127-1, Chapter 5, *Facilities and Structures Documentation, Design, Construction, Test, and Inspection Requirements*.

3.8 GEOLOGY AND SOILS

3.8.1 Geology

The southern portion of Vandenberg AFB is located within a geologically complex transition zone between the Transverse Ranges and geomorphic province to the south and the Coast Ranges geomorphic province to the north.

SLC-3W is on a paleo-marine terrace commonly known as the Lompoc Terrace, which is bounded on the north by the Santa Ynez River, and on the south by the Santa Ynez Mountains. The terrace is a down-dropped fault block comprising up to 1,000 feet of unconsolidated sediment (Evenson and Miller 1961). The unconsolidated deposits consist of Recent dune sand and alluvium overlying the Pleistocene Orcutt Sand and Pliocene Careaga Sand Formations. The Miocene Monterey and Miocene-Pliocene Sisquoc Formations (shale bedrock) unconformably underlie the Careaga Formation. The Monterey and Sisquoc Formations outcrop approximately 750 feet south of the project area.

SLC-3W is bedrock underlain by approximately 250 feet of unconsolidated sediments known as Orcutt Sands (Figure 3-7). In the project area, the Orcutt Sand consists of medium to coarse-grained sand, clay with some pebbly, well-sorted gravels, and some clay lenses (Versar, Inc. 1991).

Numerous onshore and offshore faults have been mapped within the vicinity of Vandenberg AFB; most are inactive and not capable of surface fault rupture or of generating earthquakes (U.S. Air Force 1989a). Four major faults have been mapped on Vandenberg AFB: the Lion's Head, Hosgri, Santa Ynez River, and Honda Faults (U.S. Air Force 1989b). The Lion's Head Fault runs through North Vandenberg AFB,

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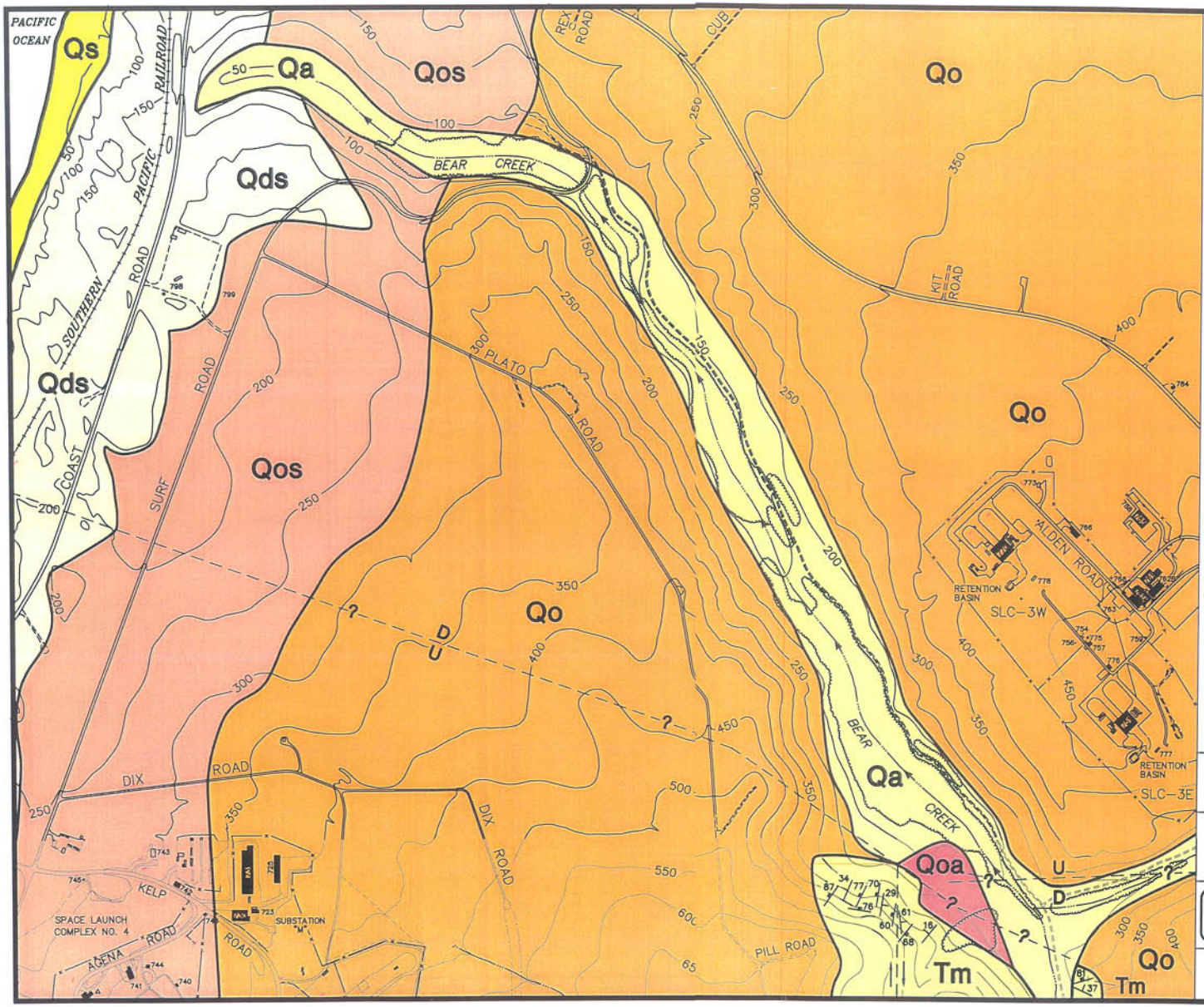

LEGEND

- CONTOUR LINE, 50 – FOOT INTERVALS
- FENCE
- PAVED ROAD OR STREET
- DIRT ROAD
- BUILDING
- RAILROAD
- VEGETATION LINE
- UNLINED DRAINAGE ROUTE AND FLOW DIRECTION
- Qs — BEACH SAND DEPOSITS
- Qds — DUNE SAND DEPOSITS
- Qa — VALLEY AND FLOOD PLAIN ALLUVIAL DEPOSITS
- Qos — OLDER DUNE SAND DEPOSITS
- Qoa — REMNANTS OF STREAM TERRACE DEPOSITS
- Qo — ORCUTT SAND
- Tm — MONTEREY SHALE
- STRIKE AND DIP OF BEDDING
- STRIKE AND DIP OF JOINT
- VERTICAL JOINT
- ANTICLINE
- CONTACT
- U/D FAULT

N

0 400' 800' 1200'

SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

GEOLOGIC MAP OF
SLC–3W

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TASK NO.	DATE	DRAWN BY	MADE FROM	GIS FILE #	Figure
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and the Hosgri, Santa Ynez, and Honda Faults run through South Vandenberg AFB. The Honda Fault is located approximately 2.5 miles south of SLC-3, and is not believed to be active or potentially active (Versar, Inc. 1991). Two small faults, the Lompoc Terrace Fault and an inferred, unnamed fault trend across the Lompoc Terrace and through Bear Creek Canyon southeast of SLC-3E, however, these faults do not cross SLC-3W (Figure 3-7). These faults may be related to the Santa Ynez Fault system which is not considered active (Versar, Inc. 1991). The San Andreas fault is capable of generating strong ground motion at the site, based on its historic seismicity and size, even though it is more than 60 miles from the project area.

The secondary effects of fault rupture are earthquake ground motions, or seismicity. The Western Transverse Ranges have historically been in a moderately high seismic region. Since 1900, within a 20-mile radius of the project area, there have been over 90 earthquakes with magnitudes ranging from 3.0 to 7.3 (U.S. Air Force 1989a). Two earthquakes were notable, one in 1812 (magnitude 7.1), most likely epicentered in the Santa Barbara Channel, and the other in 1927 (magnitude 7.3), offshore near Point Arguello. The 1927 event may have occurred less than 20 miles west of South Vandenberg AFB. Vandenberg AFB is located in Seismic Hazard Zone 4, as defined by the Uniform Building Code (International Conference of Building Officials 1991), characterized by areas likely to sustain major damage from earthquakes, and corresponds to intensities of 7 or higher on the Modified Mercalli Scale. Seismic Hazard Zone 4 is the most severe seismic region. Consequently, the seismic design of all-new or modified facilities, structures, and equipment shall be in accordance with all applicable Air Force standards. Equipment that has the potential to cause the following hazards must be designed to withstand an earthquake:

- Severe personal injury;
- A catastrophic event; or
- Significant impact on a space vehicle or missile processing and launch capability.

Shallow failures (i.e., 5 to 10 feet deep) such as slumps, rock falls, debris-or mudflows, and deep-seated landslides have not been identified in the immediate project area location. From a geologic standpoint, natural slopes on or adjacent to the area have been stable for many hundreds of years, although significant modifications to slopes, may change slope conditions.

3.8.2 Topography and Soils

Soil deposits occur on most slopes and surfaces where bedrock is not exposed. The deposits were developed by weathering of the underlying Orcutt Formation. Soil thickness varies throughout the project area, but is generally less than 3 feet (U.S. Air Force 1998a). Because of the slope of the terrain on South Vandenberg AFB, drainage (surface runoff) and erosion affect local soils. Soils in the areas of SLC-3W are not considered highly suitable for commercial agricultural uses. There are no prime or unique farmland soils within the proposed project area.

Erosion of soils and bedrock materials is a continuing process caused by running water and wind. Soils within the area vary greatly, and those that are very sandy are more susceptible to erosion than are fine-grained deposits. Excessive erosion problems have occurred at several locations in the South Vandenberg AFB area, primarily associated with developed (graded) slopes (U.S. Air Force 1989a). No problems associated with previous construction activities at the SLCs have been identified. Developed slopes are often stabilized to prevent erosion.

In the vicinity of SLC-3W, the Lompoc Terrace is cut by Spring Canyon (directly south of SLC-4), Bear Canyon (between SLC-3 and SLC-4), and Lompoc Canyon (east of SLC-3). The valley floors of these canyons are approximately 100 to 300 feet below the surrounding terrace surface. The ground surface elevation of SLC-3W ranges from 400 to 500 feet above mean sea level. Slopes within the SLC-3W boundaries are mild (less than 10 percent slope). Soils in the vicinity of SLC-3W have moderate to rapid permeability. The site is well vegetated with iceplant and nonnative grasses, reducing the potential for surface erosion (Jacobs Engineering Group, Inc. 1995).

Soils in the project area are grouped into two associations by the U.S. Soil Conservation Service (U.S. Department of Agriculture [USDA] 1972; Versar, Inc. 1991): Marina-Oceano and Tangair-Narlon. Most soils on the Lompoc Terrace belong to the Marina-Oceano association. This association is characterized by nearly level to moderately steep, somewhat excessively drained and excessively drained sands on mesas and dunes (USDA 1972). Soils at SLC-3W belong to the Marina-Oceano Association. Characteristics of soils in the two associations located within the project area are described briefly below (Versar, Inc. 1991).

3.8.2.1 Marina-Oceano Association

Highly permeable sands are the only soils in this association at SLC-3W; Oceano soils are not present. Marina soils are classified as nearly level to moderately steep, somewhat excessively drained and excessively drained, sandy soils. They are found on mesa-like areas and on terraces. These soils formed in wind-deposited sands and on dunes. Fertility is very low, and areas with these soils are often used as rangeland. Marina sand, with 2 to 9 percent slopes is the dominant soil type at SLC-3W and comprises over 70 percent of the complex. Permeability of these soils is moderate, and surface runoff is medium to rapid. The potential for erosion by water and wind is moderate to high. The shrink-swell potential and corrosivity of Marina soils are low.

3.9 TRANSPORTATION

Vandenberg AFB is accessible by Highway 101 via SR 1, SR 135, and SR 246. North Vandenberg AFB is accessible via the Santa Maria Gate at SR 1, a four-lane rural expressway extending primarily along the coastal region of California. SR 1 connects with SR 135 south of the city of Santa Maria; SR 135 then connects to Highway 101. SR 246, Central Avenue, and Santa Lucia Canyon Road also provide eastern access to Vandenberg AFB.

Access to South Vandenberg AFB is through the South Gate. South Gate is accessed via Ocean Avenue within the city of Lompoc, one of the main transportation routes connecting Lompoc with Vandenberg AFB. Ocean Avenue is a major east-west, four-lane divided road running through southern Lompoc. SR 1, or SR 246 and Central Avenue, connect Highway 101 to Ocean Avenue. SR 246 is a two-lane rural highway; Central Avenue is a two-lane undivided street running east-west through the northern part of Lompoc.

The majority of the workers and other related support service providers for Vandenberg AFB reside within the unincorporated areas of Santa Barbara County and in the cities of Lompoc, Santa Maria, Guadalupe, Buellton, Solvang, and Santa Barbara; therefore, most personnel and services for the Falcon Launch Vehicle Program would access Vandenberg AFB via Highway 101 and SRs 1, 135 and 246. Components of the Falcon (first and second stages and payloads) would be transported from the Space X facility located in El Segundo, California (Figure 1-1), and other commercial or academic facilities to Vandenberg AFB via Highway 101 and SR 246 to the South Gate.

Access to SLC-3W from South Gate would be along Arguello Road and then Bear Creek Road (see Figure 1-2). Bear Creek Road is a 2-lane arterial that provides access to the launch site location SLC-3W. Bear Creek Road is accessible through 13th Street from the north or Ocean Avenue from the east.

Railways that provide service to the cities of Santa Maria, Lompoc, Santa Barbara, San Luis Obispo, and Ventura include Southern Pacific, Santa Maria Valley, and the Ventura County Railroads. Three branch lines connect Vandenberg AFB to the Southern Pacific Railroad main line. Approximately four passenger and eight freight trains pass through Vandenberg AFB daily. The railroad tracks pass between the Pacific Ocean and the launch facilities and must be overflown during launches. However, trains are never overflown during launches due to the potential risk to people and property. An electronic surveillance system, posted railroad schedules, and close coordination, including radio communication, between train engineers and Vandenberg AFB launch personnel, are used to minimize the possibility of an overflight.

3.10 UTILITIES

Potable water and sewer are discussed in Section 3.7, Water Resources.

3.10.1 Electricity

Electricity is supplied by the Pacific Gas and Electric Company's Morro Bay Power Plant to the Vandenberg AFB main substation, where it enters the base distribution system. The base also maintains a turbine powered power plant on South Vandenberg to provide dedicated power to space launch complexes for launch operations plus emergency power generators to support technical facilities. In 1995, approximately 452 megawatt-hours of electricity were consumed by Vandenberg AFB.

3.10.2 Communications

An underground backbone fiber optic cable network runs throughout South and North Vandenberg AFB At SLC-3, there are three dedicated underground fiber optic cables: one between SLC-3 and SLC-4, one between SLC-3E and Building 488, and one between the Operations Support Building and the Payload Processing Building at SLC-3E.

3.11 SOLID WASTE MANAGEMENT

In accordance with the Commercial Space Operations Support Agreement for the Falcon Launch Vehicle Program between Vandenberg AFB and Space X (U.S. Air Force 2002a), the Vandenberg AFB sanitary landfill and refuse and recycling collection programs at Vandenberg AFB would not be available, and Space X must comply with federal, state and local laws and regulations governing the generation, transportation, treatment, storage, recycling, reuse and/or disposal of solid waste. Options for disposing of non-recyclable solid waste are the Lompoc and Tajiguas landfills as discussed below.

3.11.1 Lompoc Landfill

The Lompoc Landfill, approximately 13 miles from the Vandenberg AFB Main Gate, is operated and managed by the city of Lompoc. Based on projected disposal rates, the landfill has a life expectancy through 2050 (U.S. Air Force 1998a). It is permitted to accept up to 500 tons per day, with an anticipated average of 127 tons per day of waste. The landfill accepts imported solid waste in addition to the regular incoming waste.

3.11.2 Tajiguas Landfill

The Tajiguas Landfill, approximately 44 miles from the Vandenberg AFB Main Gate, is operated and managed by Santa Barbara County. It is permitted to accept up to 1,500 tons per day (U.S. Air Force 1998a). This landfill accepts imported solid waste in addition to the regular incoming waste.

3.12 HEALTH AND SAFETY

Space X would prepare specific safety plans that would be developed to ensure that the Falcon Launch Vehicle Program's refurbishment and operation are in compliance with applicable regulations, as specified in numerous compliance documents, and by various organizations, including the following:

- EWR 127-1, *Range Safety Requirements*;
- Air Force Manual 91–201, *Explosive Safety Standards* (per EWR 127-1);
- DoD Standard 6055.9, Ammunition and Explosives Safety Standards (per EWR 127-1);
- SWI 32–102, *Fire Prevention*;
- AFI 91–110, *Nuclear Safety Review and Launch Approval for Space or Missile Use of Radioactive Material and Nuclear Systems; Supplement 1 to AFI 91-110; AFI 40-201, Managing Radioactive Material in the U.S. Air Force*; and SWI 40–101, *Managing Radioactive Material on Vandenberg AFB* (for minute amounts of radioactive materials typical of scientific equipment potentially present in payloads);
- SWI 31–101, *Installation Security Instruction*; AFI 31–101, *Air Force Installation Security Program*; and DoD 5220.22-M, *National Industrial Security Program Operating Manual*;
- AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*;
- Air Force Occupational Safety and Health Standards;
- National Fire Protection Association, National Fire Codes;
- American National Standards Institute; and
- OSHA.

In addition to the environmental review and determination, the project proponents for the Falcon Launch Vehicle Program must complete a safety review and approval. More discussion is provided below on the specific safety requirements for construction and operation of a space launch program at Vandenberg AFB.

3.12.1 Operation

Vandenberg AFB has established safety requirements and procedures for the areas affected by launch operations. Launches are not allowed to proceed if they present an undue hazard to persons and property

due to potential dispersion of hazardous materials, propagation of blast, or other health and safety effects. A discussion of Vandenberg AFB requirements and procedures for range safety, fire protection, mission/vehicle reliability, quantity distance criteria, hazardous materials transportation safety, toxic release contingency, exposure criteria, and security is provided below.

Range Safety Requirements and Procedures

Range Safety Requirements. Eastern and Western Range 127-1, *Range Safety Requirements* establishes overall range safety regulations for Vandenberg AFB. The objective of the range safety program is to ensure that the general public, launch area personnel, foreign land masses, and launch area resources are provided with an acceptable level of safety, and that all aspects of pre-launch and launch operations adhere to public law. EWR 127-1 provides a framework for review, approval of all hazards associated with construction, pre-launch, and launch operations and incorporates all Air Force, DoD, and other applicable health and safety standards.

Active range safety involvement in a program from the earliest concept phases through launch enhances the chances for a safe program. To implement this, the Air Force has developed the "Concept to Launch" process, which identifies key safety milestones to ensure that all aspects of safety are addressed. This process for new launch programs includes an introduction to range safety, development of a Safety Plan and Preliminary Hazard Analysis, tailoring of EWR 127-1 for specific program requirements, noncompliance resolution, flight analysis review, launch vehicle elements and ground support equipment design review, airborne range safety approval for launch operations, safety critical launch operations, and final range safety clearance to launch. These safety requirements are applicable to the launch vehicle, payload, support equipment, and facilities for each launch program. The safety review procedure provides a means of substantiating compliance with program safety requirements and encompasses all systems analyses and testing as required by the DoD. Program-specific safety documents, including a Missiles System Prelaunch Safety Data Package must be prepared to meet the requirements of EWR 127-1.

Range Safety Procedures. Impact debris corridors are being established for the Falcon Launch Vehicle Program as part of the program's safety review using the results of a debris analysis. Impact debris corridors would be established off the Santa Barbara County coast between Point Sal and Point Conception to meet security requirements and reduce the hazard to persons and property during a launch-related activity. Impact debris corridors are established through the designation of debris impact areas for each specific launch.

The 30th Space Wing Flight Analysis notifies the 30th Range Squadron of areas that are hazardous to aircraft (i.e., impact debris corridors) for all normally jettisoned and impacting stages by 30 working days prior to launch. The 30th Range Squadron notifies the FAA so that the appropriate Altitude Reservation (ALTRV) or Notice to Airmen can be disseminated. Restricted and Warning Areas would be active and controlled according to EWR 127-1, Range Safety Requirements, Safety Operating Instructions, 30th Space Wing regulations, and FAA directives and regulations. Control of air traffic in FAA-designated areas around the launch head would be maintained and coordinated between the Military Radar Unit and FAA to ensure that non-participating aircraft are not endangered by launches. The Military Radar Unit would restrict aircraft movement in Restricted Airspace and Warning Areas beginning 15 minutes prior to the scheduled launch time and until the launch is complete.

Zone closures are announced daily over various radio frequencies and posted in harbors along the coast. The 30 SW Flight Analysis notifies the 30th Range Squadron of areas that are hazardous to shipping for all normally jettisoned and impacting stages by 30 working days prior to launch. This information is

published weekly in the U.S. Coast Guard Long Beach Broadcast to Mariners. Broadcasts by U.S. Coast Guard Long Beach provide the latest available hazard information to offshore surface vessels.

The 30th Space Wing has developed procedures related to evacuating or sheltering personnel on offshore oil platforms during launch operations. These procedures pertain to offshore platforms located west of 120 degrees 15 minutes longitude. The 30th Space Wing Chief Safety notifies the Range Squadron of future launches, and Range Squadron notifies the Minerals Management Service to notify oilrig personnel of a future launch. The Minerals Management Service will first notify the oilrig operator 10 to 15 days before a launch to prepare for possible sheltering or evacuation. The second notice is given 24 to 36 hours before the launch, confirming the requirement to shelter or evacuate. The third notice is given by Frontier Control to provide final notice before, during, and after securing the operation. Additional notices are sent as required.

Ocean Beach County Park would likely be closed to public access prior to launches from SLC-3W. Low-azimuth launches (180 degrees or less) from SLC-3W would also likely require closure of Jalama Beach County Park. The beaches are within the range safety zone that has been calculated for South Vandenberg AFB. Although direct overflight of the beaches does not occur or is expected to occur, there is the possibility of debris from a launch anomaly impacting the beaches. In order to protect park visitors, Vandenberg AFB, the County Parks Department, the County Sheriff, and the California Highway Patrol have agreed to close the parks upon request during launches affecting the beaches. All launches of the Atlas II and Delta II require the closure of Ocean Beach; all Titan II and Titan IV launches require closure of both parks.

Railways that provide service to the cities of Santa Maria, Lompoc, Santa Barbara, San Luis Obispo, and Ventura include Southern Pacific, Santa Maria Valley, and the Ventura County Railroad. Three branch lines connect Vandenberg AFB to the Southern Pacific Railroad main line. The railroad tracks that pass between the Pacific Ocean and the launch facilities must be overflown during launches. However, trains are never overflown during launches due to the potential risk to people and property. An electronic surveillance system, posted railroad schedules, and close coordination, including radio communication, between train engineers and Vandenberg AFB launch personnel, are used to minimize the possibility of an overflight.

Launch vehicle mishaps (i.e., accidents involving any launch vehicle operation) are handled by various emergency support teams on Vandenberg AFB. Some of these procedures include authorization to enter an accident area, control procedures for monitoring trains, and salvage procedures. Several distinct teams of qualified individuals from Vandenberg AFB are available to respond to emergencies that might occur during launch. These teams include the Specialized Operation Support Team, the On-Scene Disaster Control Group, the Missile Potential Hazard Team, and the Launch Support Team.

Regionally, Santa Barbara County prepared a Hazardous Materials Response Plan that is used for countywide disaster response (see Section 3.6 for hazardous materials/hazardous waste requirements of the Falcon Launch Vehicle Program). Cities and communities in the county are required to have their own emergency response plans that were incorporated by the county into a comprehensive Multi-Hazard Functional Plan in 1989 and amended in 1994. Because of the potential for Vandenberg AFB operations to affect off-base areas, Vandenberg AFB plays a prime role in regional emergency planning (Environmental Science Associates 1996; U.S. Air Force 1989a).

The City of Lompoc and Vandenberg AFB have entered into a mutual aid agreement, which allows emergency units from either Lompoc or Vandenberg AFB to immediately notify the city in case of a major accident on the base. In the event of an emergency involving a launch mishap in Lompoc,

Vandenberg AFB would assume control and could set up a national defense area if protected material were involved in the accident. In the event of a launch vehicle impacting areas outside Vandenberg AFB, the On-Scene Disaster Control Group from Vandenberg AFB would respond to the accident upon request of the county. County agencies would be requested to help in the evacuation and possible fire control for such an incident. Military personnel would assume responsibility for disaster control in the immediate impact area.

Fire Protection System Requirements

Fire protection, alarm, and fire suppression systems must be provided for all fuel holding areas and support facilities. Flame detectors in the fuel holding areas would activate both the area deluge water system and alarms to the Air Force Fire Department.

Mission/Vehicle Reliability Requirements

Mission reliability is measured from launch commit and is defined as the probability of successfully placing the payload into its delivery orbit with the required accuracy, and then executing a collision avoidance maneuver. Specific standards for mission/vehicle reliability are contained in EWR 127-1, Range Safety Requirements and must be adhered to.

Quantity Distance Criteria Requirements

Explosive safety quantity-distance criteria are used to establish safe distances from launch complexes and associated support facilities to non-related facilities and roadways. DoD and Air Force Explosive Safety Standards establish these regulations. The criteria utilize the trinitrotoluene-, also called TNT-, explosive equivalent of propellant, to determine safe distances from space launch operations or processing and holding areas. SLC-3W was originally sited to meet these criteria under the Atlas II program. Per EWR 127-1, Section 5.6, all facilities including launch complexes, used to store, handle, or process ordnance items or propellants shall be properly sited and approved in accordance with DoD quantity distance criteria and explosives safety standards as specified in DoD 6055.9-STD and implemented in Air Force Manual 901-201. Final approval from the Department of Defense Explosive Safety Board must be obtained prior to the start of refurbishment of the SLC-3W facility.

Hazardous Materials Transportation Safety Requirements

Hazardous materials such as propellant, ordnance, chemicals, and other payload components must be transported to Vandenberg AFB in accordance with Department of Transportation regulations for interstate shipment of hazardous substances (Title 49 CFR 100–199). Hazardous materials such as liquid rocket propellant must be transported in specially designed containers to reduce the potential of a mishap should an accident occur. For some hazardous materials, each state may have its own required transportation routes, time of shipments, and permits. To date, no major accidents involving the shipment of hazardous materials associated with launch vehicles at Vandenberg AFB have occurred.

Toxic Release Contingency Plan Requirements

A Toxic Hazard Assessment for the Falcon Launch Vehicle Program would be required to determine program-specific launch vehicle, payload, ground-support equipment, and facility toxic materials use; the existing Toxic Release Contingency Plan for Vandenberg AFB may also have to be updated according to the results of the assessment. Toxic Hazard Assessments are also conducted to develop and control Toxic Hazard Zones for each launch. Toxic Hazard Assessments provide the appropriate safety clear areas for

the storage, handling, and transfer of propellants; they also provide for protection of workers and the general public during vehicle processing and launch operations. The Toxic Hazard Assessments must be completed and the Toxic Release Contingency Plan must be updated, if necessary, prior to loading or storing the program's toxic materials.

At SLC-3W, a standard dispersion computer model, run by installation meteorological/environmental personnel, would be used for both normal and aborted launch scenarios prior to launch. If the model predicted that populated areas lay within the toxic hazard corridor (THC), the launch would be delayed until more favorable meteorological conditions existed. De-tanking or other procedures to be followed in the event of a launch delay or cancellation would be established and would generally be in accordance with procedures used for current vehicle systems.

Exposure Criteria Requirements

The Headquarters Air Force Space Command Surgeon's Office (HQ AFSPC/SG) has either endorsed or recommended exposure criteria for some of the current liquid rocket propellants and their combustion by-products (including RP-1). Health hazards may be created from propellant spills or from the passage of launch plumes/launch abort clouds. The chemicals chosen for these criteria are those estimated to present the most significant health concerns to the public and launch facility workers. The recommended and endorsed exposure criteria are factored into the exposure prediction and risk management models and the launch commit decisions used by the Range Safety functions at Vandenberg AFB.

Currently there are no regulatory health exposure limits or public exposure criteria for vapors of hydrotreated kerosene. However, both the National Institute for Occupational Safety and Health and the National Academy of Sciences/National Research Council/Committee on Toxicology have recommended exposure limits for individuals occupationally exposed to vapors of similar substances.

Security Requirements

Security requirements for launch sites, an integral component of project safety, are contained in SWI 31-101, AFI 31-101, and DoD Manual 5220.22-M. Site security requirements would include security lighting and an intrusion detection system.

3.12.2 Refurbishment

Refurbishment requirements for the Falcon Launch Vehicle Program are as follows:

- EWR 127-1, Chapter 5, *Facilities and Structures Documentation, Design, Construction, Test, and Inspection Requirements;*
- AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects;*
- Air Force Occupational Safety and Health Standards;
- National Fire Protection Association, National Fire Codes;
- American National Standards Institute; and
- OSHA.

3.13 SOCIOECONOMICS

The influence of Vandenberg AFB on population and employment varies widely within Santa Barbara County. Vandenberg AFB generally influences northern Santa Barbara County, which encompasses the city of Lompoc, the area north of Lompoc, and the Santa Maria Valley. Although Vandenberg AFB draws commuters from southern San Luis Obispo County, commuters from this region are estimated to comprise less than 5 percent of the total San Luis Obispo County labor force.

Based upon the 2000 Census of Population and Housing, Santa Barbara County had a population of 399,347 persons (U.S. Bureau of Census 2000). Land use restrictions and water availability constrain development and population growth in much of southern and central California, including southern Santa Barbara County. In northern Santa Barbara County, however, water supplies do not constrain projected growth as severely, although overdraft of groundwater basins may inhibit production of housing. In the Lompoc and Santa Maria regions, housing production has been limited in comparison to available capacity of vacant residential land (U.S. Air Force 1998a).

3.14 ENVIRONMENTAL JUSTICE

Environmental justice is defined by the U.S. EPA as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations. Section 989.33 of AFI 32-7061, *Environmental Impact Analysis Process* requires that a project proponent comply with EO 12898 to ensure that these types of impacts are considered in EAs and other environmental documents.

The 2000 Census of Population and Housing reports numbers of minority residents. Minority populations included in the census are identified as Black or African American, American Indian and Alaskan Native, Asian, Native Hawaiian/Other Pacific Islander, Hispanic, or Other. Based upon the 2000 Census of Population and Housing, Santa Barbara County had a population of 399,347 persons. Of this total, 172,264 persons, or 43.14 percent, were minority.

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4.0 ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential environmental consequences or impacts associated with the Proposed Action, Alternative 1, and No-Action Alternative. Changes to the natural and human environment that could result from the project alternatives were evaluated relative to the existing environmental conditions described in Chapter 3.0. A major focus of Chapter 4.0 is to analyze the level of significance associated with project-related environmental impacts and to specifically determine if any of the impacts could be classified as significant.

Under NEPA (42 U.S.C. 4321 *et seq.*), significant impacts are those that have potential to significantly affect the quality of the human environment. Human environment is a comprehensive phrase that includes the natural and physical environments and the relationship of people to those environments (40 CFR Section 1508.14). Whether an alternative significantly affects the quality of the human environment is determined by considering the context in which it will occur along with the intensity of the action (40 CFR Section 1508.27). The context of an action is determined by studying the affected region and locality, and affected interests within both. Significance varies depending on the physical setting of an alternative (40 CFR Section 1508.27). The intensity of an action refers to the severity of the impacts, both regionally and locally, and may be determined by:

- Overall beneficial project effect versus individual adverse effect(s);
- Public health and safety;
- Unique characteristics in the area (i.e., wetlands, parklands, ecologically critical areas, cultural resources, and other similar factors);
- Degree of controversy;
- Degree of unique or unknown risks;
- Precedent-setting effects for future actions;
- Cumulatively significant effects;
- Cultural or historic resources;
- Special-status species or habitats; and/or
- Compliance with federal, state, or local environmental laws.

The level at which an impact is considered significant varies for each environmental resource. Based on the criteria discussed above, a resource-specific definition of what constitutes a significant impact was prepared for each of the 15 resource areas analyzed in this chapter. This provides the EA reviewer with a basis for determining if a specific program activity will result in no impact, no significant impact, or a significant impact to a specific resource area.

4.1 LAND USE/VISUAL RESOURCES

An impact may be considered significant if the project results in nonconformance with approved land use plans, conversion of prime agricultural land to other uses, a decrease in the land's productivity, or a conflict with existing uses or values of the project area or other properties.

4.1.1 Proposed Action

4.1.1.1 Operation Impacts

Launch Site

Operations associated with the Proposed Action would occur primarily at SLC-3W, which is designated for space launch activities. Operations would be consistent with both the Base General Plan and the Air Force mission at Vandenberg AFB. The Proposed Action would not convert prime agricultural land to other uses; result in a decrease in the land's productivity; or conflict with existing uses or values of the project area or other base properties. Therefore, the Proposed Action would generate no significant impacts on on-base land use.

Activities at SLC-3W would be in conformance with its designated use (for space launch activities), and the 20-foot tall umbilical tower would be present only during a launch. Therefore, the Space X facilities would have a considerably lesser visual presence/impact than that of prior SLC-3W activities or existing SLC-3E operations, and would not be visible by the public except possibly from Ocean Beach County Park, the railroad, or the ocean. Therefore, the Proposed Action would generate no significant impacts on visual resources within the flight range of the Falcon launch vehicle.

Range

Issuance of a federal license or permit for an activity in or affecting a coastal zone must be consistent with the Coastal Zone Management Act, which is managed by the California Coastal Commission. Since the Proposed Action requires a federal launch license, and would likely require public beach closures (Ocean Beach County Park and Jalama Beach County Park) and potentially cause noise impacts on wildlife in the coastal zone offshore of Vandenberg AFB including in the Channel Islands National Park, Channel Islands Marine Sanctuary, and the International Biosphere Reserve (see Section 4.3, Biological Resources), a Coastal Consistency Certification would be required for the proposed project and must be submitted to the Coastal Commission by Space X.

Beach closures may impact recreational activities; however, since beach closures would be very infrequent over the course of a year, with only a maximum of 2 to 3 launches per year under the Falcon Launch Vehicle Program, impacts on public access would be less than significant. Potential cumulative impacts on land use due to beach closures are discussed in Section 4.15, Cumulative Impacts. Restriction of public access to the Channel Islands National Park, Channel Islands National Marine Sanctuary, or International Biosphere Reserve would not be necessary for the Falcon Launch Vehicle Program. Potential noise impacts on wildlife in the coastal zone are discussed in Section 4.3, Biological Resources, and potential noise impacts on humans in the coastal zone are discussed in Section 4.2, Noise.

4.1.1.2 Refurbishment Impacts

As SLC-3W is designated for space launch activities, refurbishment activities would therefore generate no impacts on the land use of the project area and surrounding areas.

4.1.2 Alternative 1

4.1.2.1 Operation Impacts

Operation impacts on land use under Alternative 1 would be identical to those generated under the Proposed Action; therefore operation impacts on land use would be less than significant.

4.1.2.2 Refurbishment Impacts

As there would be no launch water deluge system constructed under this Alternative, the impacts on land use generated by refurbishment activities would be slightly less than those generated under the Proposed Action; therefore, there would be no refurbishment impacts on land use.

4.1.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented, therefore, there would be no operation or refurbishment impacts on land use.

4.1.4 Mitigation Measures

Because less than significant impacts on land use and visual resources would occur, no mitigation measures are recommended.

4.2 NOISE

Noise impact criteria are based on land use compatibility guidelines and on factors related to the duration and magnitude of noise level changes. Annoyance effects are the primary consideration for most noise impact assessments on humans. Noise impacts on wildlife are discussed in Section 4.3, Biological Resources.

Because the reaction to noise level changes involves both physiological and psychological factors, the magnitude of a noise level change can be as important as the resulting overall noise level. A readily noticeable increase in noise levels would often be considered a significant effect by the local residents, even if the overall noise level was still within land use compatibility guidelines. On the other hand, noise level increases that are unnoticed by most people are not considered a significant change, even if the overall noise level is somewhat above land use compatibility guidelines.

Finally, certain noise levels (e.g., from sonic booms) have the potential to break glass or damage structures. A high risk or high potential to break glass or damage structures due to noise levels generated from the proposed project would be considered a significant impact.

Some potentially significant published thresholds for noise impacts on humans include the following:

- A L_{DN} of 65 dBA, or a CNEL of 61 dBC for sonic booms or rocket noise, is the generally accepted limit for outdoor noise levels in residential areas (Departments of the Air Force, Army, and Navy 1978; Department of Housing and Urban Development 1978). Project related noise levels 5 dB or more above 65 dBA or above 61 dBC would be considered a significant impact.

- Project-related overpressures above 1 psf would have the potential to break glass or cause damage to structures, and therefore, would be considered a significant impact.

- Temporary noise sources such as refurbishment and demolition that are restricted to daytime hours would be considered significant if they resulted in noise levels 10 dB or more above the 85 dBA noise threshold limit value for construction workers in an 8-hour day.

4.2.1 Proposed Action

4.2.1.1 Operation Impacts

Noise generated during operation of the Proposed Action is discussed below in terms of engine noise and sonic boom noise. As the Falcon has yet to be launched, actual noise levels that would be generated from the vehicle are unknown. However, engine noise from the Falcon vehicle was modeled from actual noise levels measured during engine tests on the vehicle, and sonic boom noise was modeled using the planned flight trajectories and size and configuration of the Falcon vehicle.

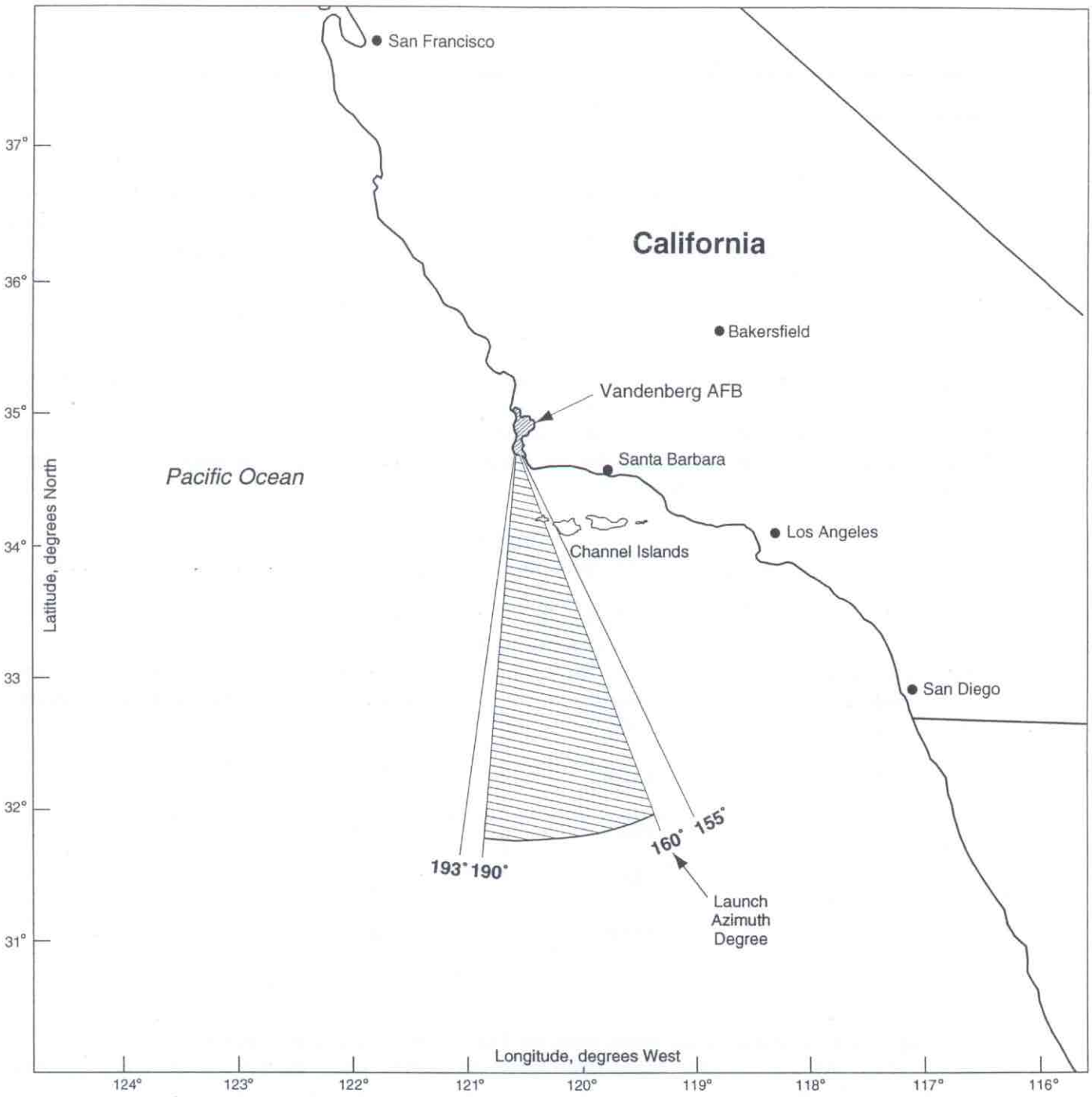
For the purposes of this EA, modeled noise levels for the Falcon vehicle are compared with actual and modeled noise levels from launches of the Atlas IIAS launch vehicle to evaluate noise impacts. Figure 2-1 presents a comparison of the configurations of the Falcon vehicle and the Atlas IIAS vehicle. Table 4-1 presents a comparison of the specifications of the Falcon vehicle and the Atlas IIAS vehicle. In terms of size and configuration, the Falcon vehicle is significantly smaller in comparison to the Atlas IIAS vehicle currently launched out of SLC-3E (Table 4-1). Launches from SLC-3E are currently approved for Atlas IIAS launches in a range of azimuths from 155 to 193 degrees; the proposed Falcon Launch Vehicle Program would be conducted within 160 to 190 degrees (see Figure 4-1 for a comparison of azimuths).

Table 4-1
Comparison of the Falcon Vehicle Specifications with the Atlas IIAS Vehicle Specifications

Launch Vehicle	Vehicle Weight (lbs)	Height (feet)	Fuel Types
Falcon	49,000	68	LOX RP-1
Atlas IIAS	413,500	156	LOX RP-1 Anhydrous hydrazine Liquid hydrogen Ammonium perchlorate

Notes:
Use of deluge water systems for noise suppression are assumed for each vehicle.
Source: U.S. Air Force 1998a.

Noise data on the Atlas IIAS was obtained from recent noise monitoring conducted on launches by SRS Technologies (SRS Technologies 2000, 2001) and also summarized by The Aerospace Corporation (The Aerospace Corporation 2003) for this EA. Data from the SRS Technologies reports include both measured engine noise levels and predicted sonic boom footprints for launches of the Atlas IIAS that occurred in December 1999 and September 2001.



LEGEND

Range of potential launch azimuths for the Falcon

Azimuth - The compass direction along which the launch vehicle's ground track lies in its early flight

Range of launch azimuths approved for the Atlas

0 20 40 80 Miles

Source: Modified from U.S. Air Force 1998a.

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

COMPARISON OF LAUNCH AZIMUTHS FOR THE FALCON AND ATLAS

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-04	6/19/03	IGE	EELV/091	g:/commercial/1295-03 XSPACE/4-1 Azimuths.ai	4-1

Engine Noise

Noise levels for the Falcon vehicle were modeled using noise measurements taken on the Falcon vehicle engine in April 2003. Noise measurements were taken 200 feet from the engine, 60 degrees off the engine axis; a maximum unweighted noise level of 145 dB was measured at this location. From this data and an estimated atmospheric attenuation rate of 0.22 dB per 100 meters (SRS Technologies 2000, 2001), unweighted noise levels at 1, 3, 5, 7, and 9 miles from SLC-3 were calculated for the Falcon vehicle (see Table 4-2). Appendix D shows the results of the engine noise level modeling for the Falcon launch vehicle.

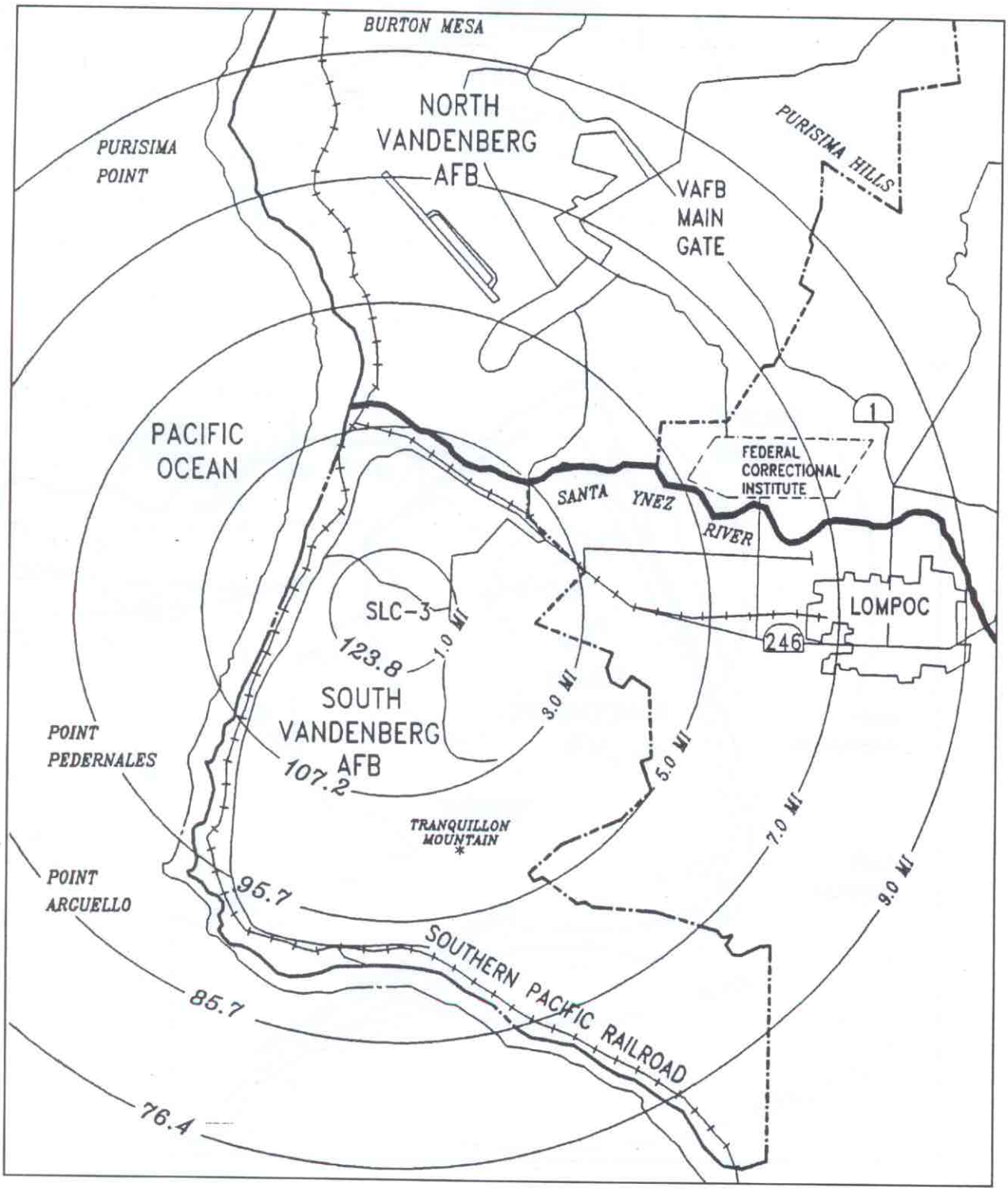
Maximum unweighted rocket noise levels from actual Atlas IIAS vehicle launches are also shown in Table 4-2. These values are based upon measurements of SELs at 9.9 kilometers from SLC-3E (SRS Technologies 2000 and 2001). These values were subsequently extrapolated to produce noise contours at varying distances from the launch site for the purposes of this EA. The assumptions behind these extrapolations are provided in Appendix D.

Table 4-2
Comparison of Engine Noise Levels from the Falcon Vehicle and the Atlas IIAS Vehicle (dB)

Distance from SLC-3 (miles)	Actual Noise Levels from the 19 December 1999 Atlas IIAS Launch	Actual Noise Levels from the 8 September 2001 Atlas IIAS Launch	Modeled Noise Levels for the Falcon Vehicle
1	158.2	152.0	113.3
3	141.6	135.4	96.7
5	130.1	123.9	85.2
7	120.1	113.9	75.2
9	110.8	104.6	65.9

On average, modeled engine noise levels from the Falcon vehicle are approximately 39 to 45 dB lower than the Atlas IIAS noise levels. These noise levels are in dBs, where the full spectrum is considered rather than the partial spectrum used in the A-weighted measurement. When converted to an A-weighted scale (by subtracting 34.4 dB), modeled noise levels for the Falcon vehicle are predicted to be approximately 41 dBA in Lompoc (at 7 miles from the launch pad) and 90 dBA at the launch site (approximately 2,000 feet from the launch pad). Noise at this level would effectively continue for approximately 20 seconds and then decrease significantly to levels below 85 dBA. Figure 4-2 shows the actual noise contours for the 19 December 1999 launch of the Atlas IIAS in A-weighted decibels and Figure 4-3 shows the predicted noise contours for Falcon launch vehicle in A-weighted decibels.

Based on modeled engine noise levels for the Falcon, it is anticipated that noise levels under the Proposed Action would not (1) exceed the L_{DN} threshold of 65 dBA in nearby residential areas (Lompoc) or (2) exceed the 85 dBA noise threshold limit value recommended for workers in an 8-hour day. In addition, engine noise levels would be considerably less than those generated by the Atlas IIAS from SLC-3E. Therefore, impacts on humans due to rocket noise would be less than significant under the Proposed Action.



Source of Data: The Aerospace Corporation 2003.

1 0 2 4

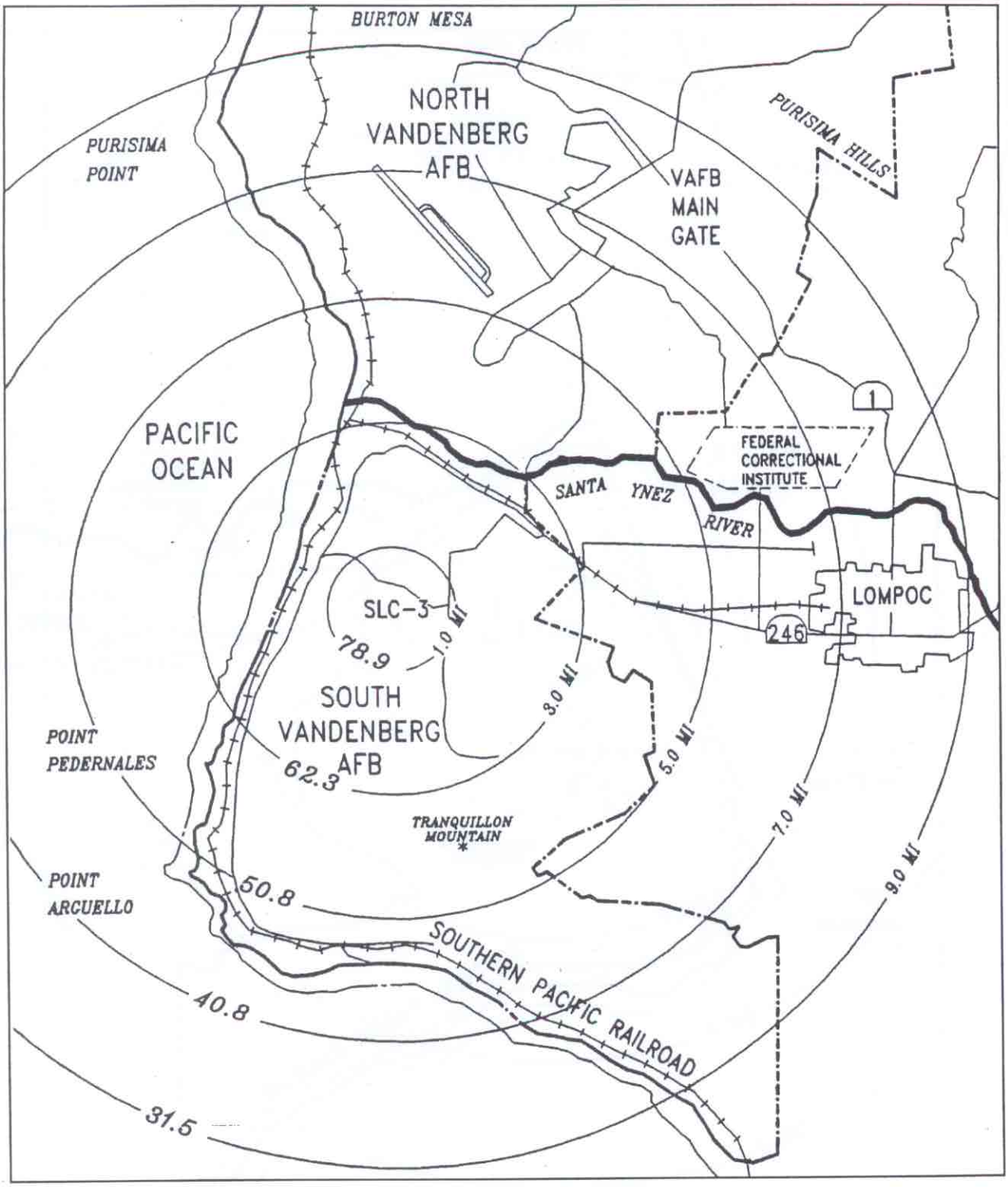
STATUTE MILES

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

ACTUAL MAXIMUM A-WEIGHTED NOISE LEVELS FOR ROCKET NOISE FOR AN ATLAS IIAS LAUNCH VEHICLE (DECEMBER 1999 LAUNCH)

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-04	6/19/03	IGE	Versar Fig2-40	g:/commercial/1295-03 XSPACE/4-2maxnoise.ai	4-2



Source of Data: The Aerospace Corporation 2003.

1 0 2 4

STATUTE MILES

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

PREDICTED MAXIMUM A-WEIGHTED NOISE LEVELS FOR ROCKET NOISE FOR FALCON VEHICLE

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-04	6/19/03	IGE	Versar Fig2-40	g:/commercial/1295-03 XSPACE/4-3 Predictedmaxnoise.ai	4-3

Sonic Booms

Sonic boom modeling was performed for the Falcon launch vehicle by The Aerospace Corporation (The Aerospace Corporation 2003) to determine overpressure levels and sound levels generated by the sonic boom from the Falcon vehicle based upon three different launch trajectories and under two different atmospheric conditions. The results of the sonic boom modeling are contained in Appendix E. The launch trajectories analyzed include the 160-, 175-, and 190-degree azimuths. Modeling was prepared using two atmospheric cases: (1) a December atmosphere with mean (nominal), high, and low December winds and (2) a 1971 standard atmosphere model with "no winds" for Vandenberg AFB. Results of the sonic boom modeling for the Falcon vehicle were also compared with results of sonic boom modeling from an actual launch of the Atlas IIAS in September 2001; sonic boom overpressure levels for the Atlas IIAS are shown on Figure 4-4 and also in Appendix E. Table 4-3 summarizes maximum overpressure levels for both the Falcon vehicle and Atlas IIAS vehicle.

Predicted sonic boom overpressures for the Falcon vehicle under mean December conditions for all three trajectories are presented in Figures 4-5 through 4-7. For December launches of the Falcon, the maximum modeled overpressure for the 160-degree launch azimuth is 2.65 psf occurring away from the Channel Islands. The largest overpressure over the islands at the 160-degree azimuth is 2.30 psf over San Miguel Island under high wind conditions; overpressures are at 1.0 psf over Santa Cruz and Santa Rosa Islands. The maximum overpressure for the 175-degree launch azimuth is 10.14 psf occurring away from the islands. The sonic boom passes over most of Santa Rosa Island and most of Santa Cruz Island. The maximum sonic boom overpressure over the islands with the 175-degree launch azimuth is 2.0 psf over Santa Rosa Island under high winds. Finally, the maximum overpressure for the 190-degree launch azimuth is 7.05 psf occurring away from the islands. The sonic boom passes over only small portions of Santa Rosa and Santa Cruz Islands with a maximum sonic boom overpressure over the islands at 1.0 psf over both islands. Given that the Falcon launch vehicle's size is an order of magnitude smaller than the Atlas IIAS, these values are consistent with results of actual launch data from the Atlas IIAS vehicle which produced a maximum overpressure of 4.0 psf over small portions of Santa Cruz Island using a 157-degree launch azimuth.

Maximum overpressure levels for sonic booms predicted for the Falcon were converted to A-weighted decibels in Appendix E. Maximum A-weighted sonic boom noise levels from the Falcon vehicle are as follows: 95.9 dBA for a 160-degree launch azimuth, 91.1 dBA for a 175-degree launch azimuth, and 99.5 dBA for a 190-degree launch azimuth under mean December wind conditions. Again, these noise levels all occur away from the islands as shown in Appendix E. Generally, the sonic boom is expected to impact Santa Cruz and Santa Rosa Islands with maximum noise levels ranging from 65 to 75 dBA. The 175-degree azimuth would produce the highest noise levels over the Channel Islands (Appendix E).

Overpressures between 6 and 8 psf have a high potential to damage structures, including the potential to break glass and cause damage to plaster, walls, and roofs (see Section 3.2, Noise). Sonic boom analysis of the Falcon launch vehicle illustrates that under any of the modeled launch trajectories, peak overpressure values on any of the Channel Islands would remain under 2.3 psf. Given that this level is under the level required to cause structural damage and relatively few structures exist under the launch trajectories, impacts on structures are not expected to occur. Finally, predicted maximum sonic boom noise levels over the Channel Islands are considerably less than those generated by the Atlas IIAS from SLC-3E. Prior to the first launch of the Falcon, sonic boom modeling will be conducted again using atmospheric conditions that would represent the actual launch conditions. Therefore, impacts on humans due to sonic boom noise would be less than significant under the Proposed Action.

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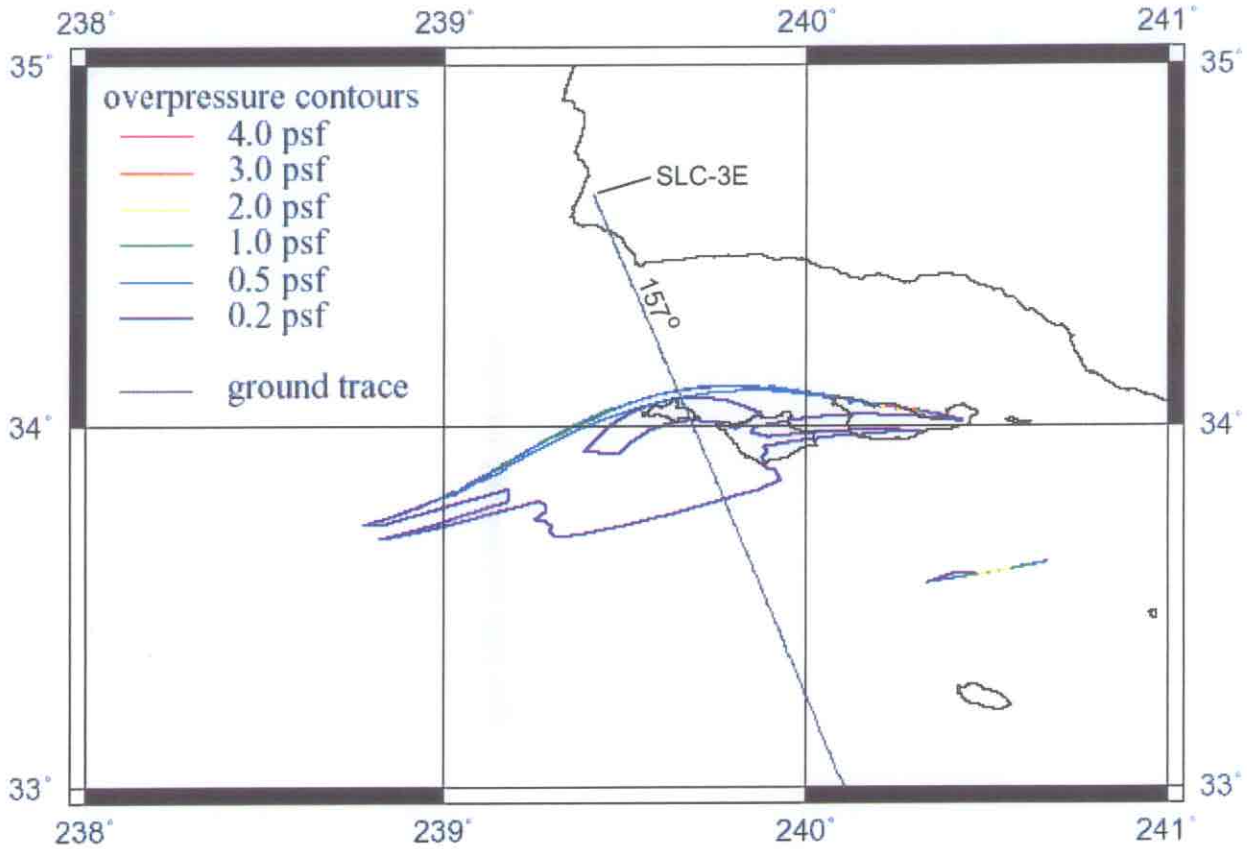
Predicted Peak Overpressure Contours for Actual Launch of Atlas IIAS

August nominal winds

Launch Sept. 8, 2001

Launch Azimuth 157°



LEGEND

psf	Pounds per square foot
SLC	Space Launch Complex

Source: THE AEROSPACE CORPORATION, 2003.

NO SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

MODELED SONIC BOOM FOOTPRINT FOR AN ATLAS IIAS LAUNCH VEHICLE (SEPTEMBER 2001 LAUNCH)

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	6/19/03	IGE	EELV/077	g:/commercial/1295-03 XSPACE/4-4 Sonic.ai	4-4

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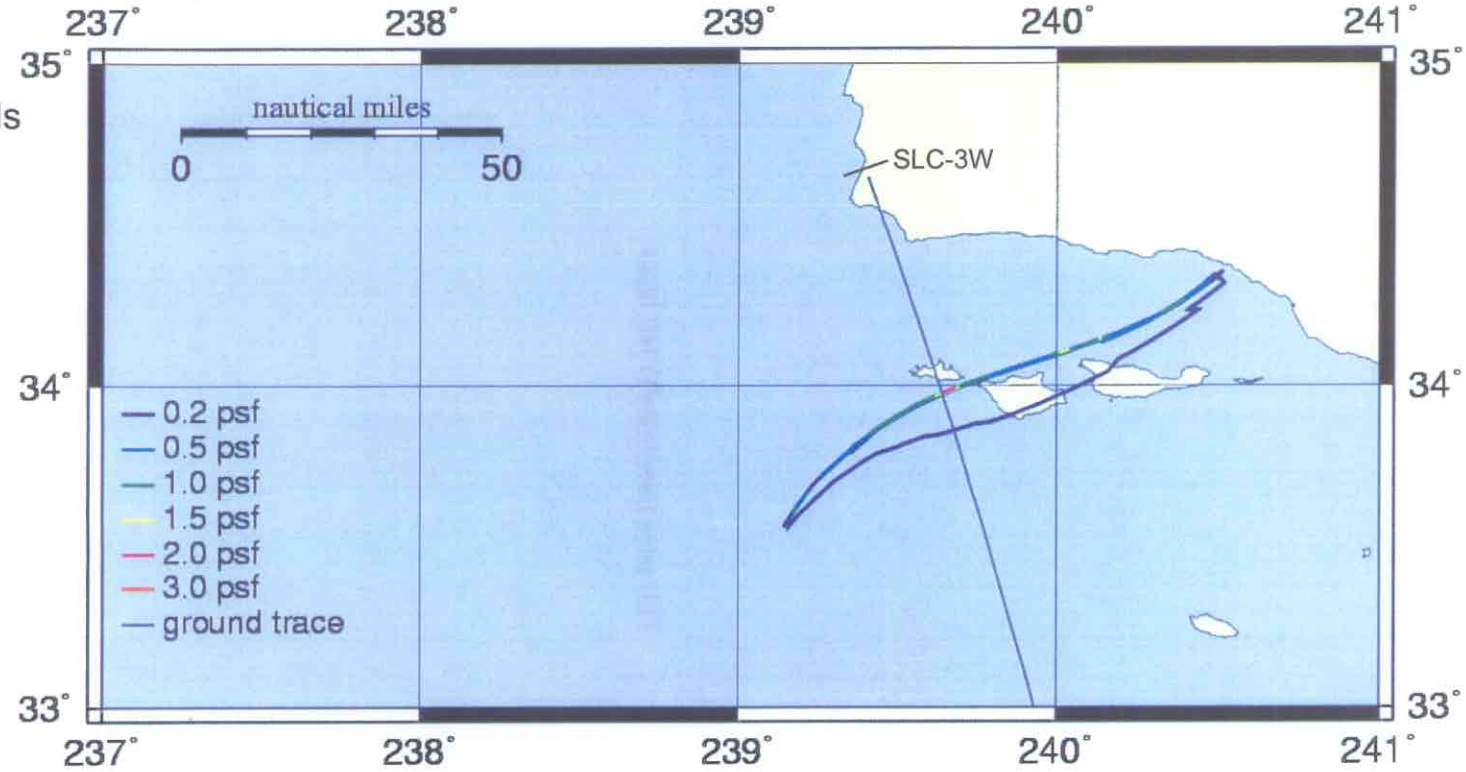
Predicted Peak Overpressure Contours for First Launch of the Falcon (160° Launch Azimuth)

Note: Largest peak overpressure of 2.65 psf

December Atmosphere and Mean Winds

Launch December 2003

Launch Azimuth 160°



LEGEND

psf	Pounds per square foot
SLC	Space Launch Complex

Source: THE AEROSPACE CORPORATION, 2003.

NO SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

MODELED SONIC BOOM FOOTPRINT FOR FALCON LAUNCH VEHICLE AT 160 DEGREE LAUNCH AZIMUTH

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	6/19/03	IGE	EELV/077	g:/commercial/1295-03 XSPACE/4-5 Sonic.ai	4-5

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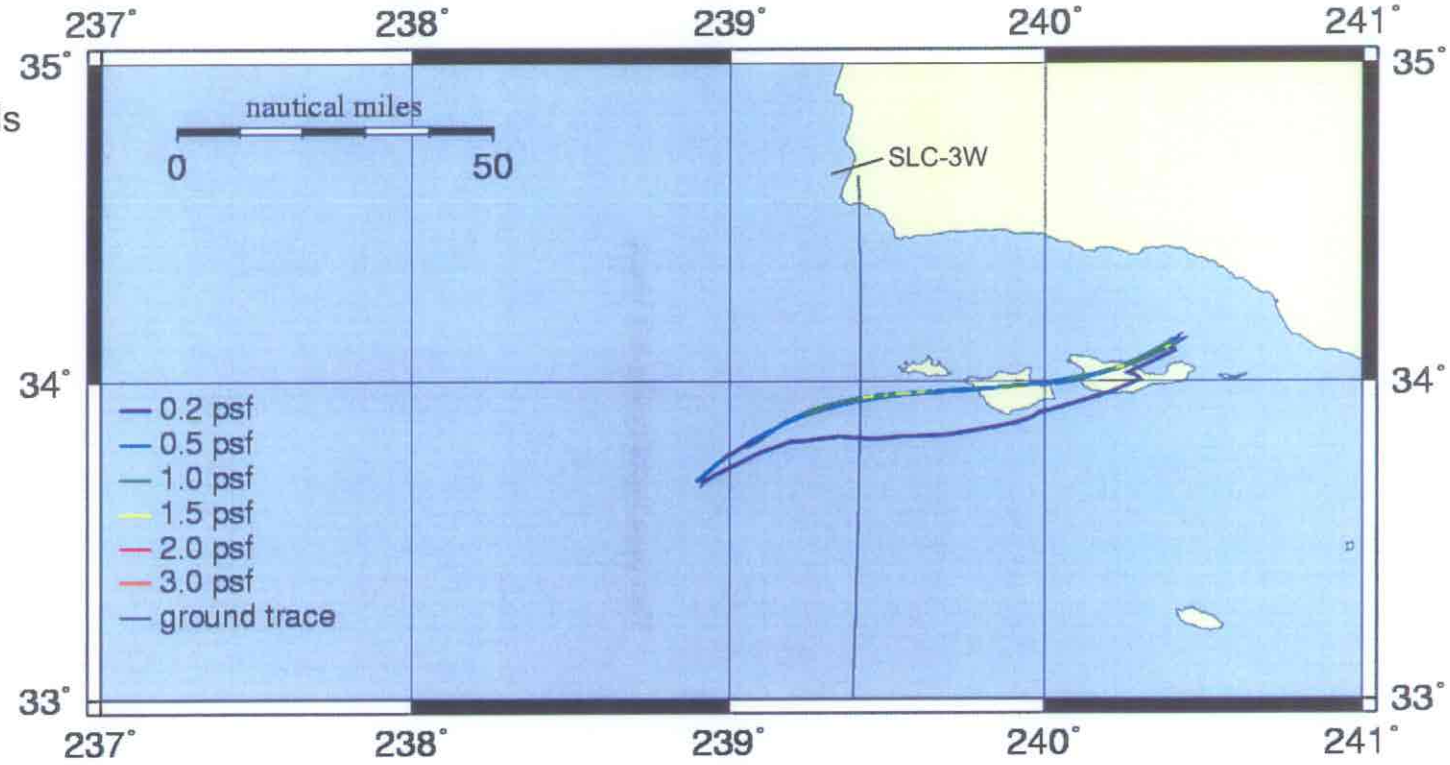
Predicted Peak Overpressure Contours for First Launch of the December Atmosphere (175° Launch Azimuth)

Note: Largest peak overpressure of 2.02 psf

December Atmosphere and Mean Winds

Launch December 2003

Launch Azimuth 175°



LEGEND

psf	Pounds per square foot
SLC	Space Launch Complex

NO SCALE

Source: THE AEROSPACE CORPORATION, 2003.

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

MODELED SONIC BOOM FOOTPRINT FOR FALCON LAUNCH VEHICLE AT 175° DEGREE LAUNCH AZIMUTH

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	6/19/03	IGE	EELV/077	g:/commercial/1295-03 XSPACE/4-4sonic.ai	4-6

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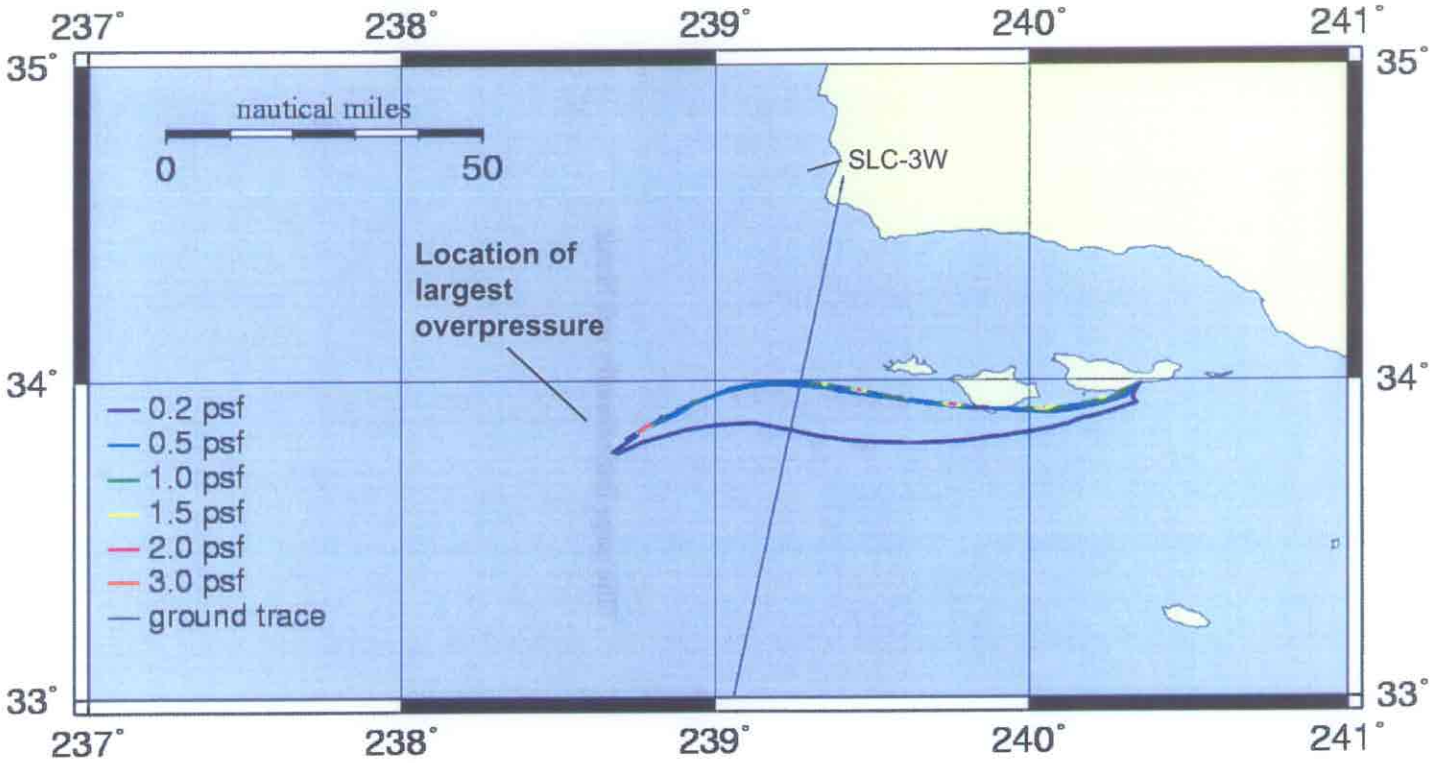
Predicted Peak Overpressure Contours for First Launch of the Falcon (190° Launch Azimuth)

Note: Largest peak overpressure of 7.05 psf

December Atmosphere and Mean Winds

Launch December 2003

Launch Azimuth 195°



LEGEND

psf	Pounds per square foot
SLC	Space Launch Complex

Source: THE AEROSPACE CORPORATION, 2003.

NO SCALE

UNITED STATES AIR FORCE
VANDENBERG AIR FORCE BASE

MODELED SONIC BOOM FOOTPRINT FOR FALCON LAUNCH VEHICLE AT 190º DEGREE LAUNCH AZIMUTH

Tetra Tech, Inc.
4213 State Street, Suite 100
Santa Barbara, CA 93110-2847

TC#	DATE	DRAWN BY	MADE FROM	FILENAME	FIGURE NO.
12958-03	6/19/03	IGE	EELV/077	g:/commercial/1295-03 XSPACE/4-7Sonic.ai	4-7

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Table 4-3
Comparison of Maximum Sonic Boom Overpressure Levels from the Falcon Vehicle and the Atlas IIAS Vehicle

Launch Trajectory (degrees)	Actual September 8, 2001 Atlas IIAS Launch (psf)	Modeled Falcon Launch (December launch)* (psf)	Modeled Falcon Launch (No Winds)* (psf)
157	4.0	NA	NA
160	NA	2.65	2.5
175	NA	10.14	1.79
190	NA	7.05	2.66

Note: *Peak overpressure levels do not impact the Channel Islands.
NA Not applicable.

4.2.1.2 Refurbishment Impacts

A temporary increase in ambient noise levels would occur at SLC-3W during refurbishment due to the operation of heavy equipment (e.g., earth moving machinery, dump trucks). No residential areas or other sensitive receptors occur at, or near, SLC-3W; therefore, refurbishment noise would not impact sensitive receptors.

Typical heavy construction equipment is muffled to not exceed the 85 dBA noise threshold limit value recommended for construction workers in an 8-hour day (American Conference of Governmental Industrial Hygienists 1992–1993). Therefore, noise impacts on construction workers would be less than significant under the Proposed Action.

4.2.2 Alternative 1

4.2.2.1 Operation Impacts

Under Alternative 1, a deluge water system would not be used. The deluge water system would be expected to reduce rocket noise levels because it would help suppress combustion noise from the post-burning of fuel-rich combustion products in the atmosphere during a launch. Therefore, engine noise levels would be expected to be higher under Alternative 1 than under the Proposed Action. Direct noise measurements are not available to indicate how much a deluge water system attenuates noise and the increase in noise levels under Alternative 1 cannot be quantified. Because no sensitive receptors occur at the launch pad, however, noise impacts would remain less than significant under Alternative 1.

4.2.2.2 Refurbishment Impacts

Noise impacts due to refurbishment activities under Alternative 1 would be identical to those under the Proposed Action.

4.2.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented, therefore, no operational or refurbishment noise would be generated.

4.2.4 Mitigation Measures

Because less than significant impacts on noise would occur, no mitigation measures are recommended.

4.3 BIOLOGICAL RESOURCES

Impacts on biological resources would be considered significant if they resulted in harm, harassment, or destruction of special-status species, including any federal or state endangered, threatened, or rare species, or its designated or proposed designated critical habitat, migration corridors, or breeding areas. The loss of a substantial number of individuals of any native plant or animal species that could affect abundance or diversity of that species beyond normal variability is also considered significant.

4.3.1 Proposed Action

4.3.1.1 Operation Impacts

Operation of the Proposed Action primarily has the potential to affect wildlife at the launch site and within the flight range of the Falcon vehicle due to engine noise and sonic boom noise, and noise associated with pre-launch helicopter overflights. In addition, generation of an exhaust cloud, extreme heat and fire in the vicinity of the launch pad, and potential launch mishaps have the potential to affect plants and wildlife.

Noise

Launch Site. Noise at the launch site includes engine noise, noise from pre-launch helicopter overflights, or noise caused by the explosion of a launch vehicle. The most intense noise levels from a launch are expected to occur within the focal range of sonic booms over the northern Channel Islands (see below). Results of engine noise modeling for the Falcon vehicle (Table 4-2 in Section 4.2, Noise) show that engine noise levels within one mile from the SLC-3W are expected to be 113.3 dB. On an A-weighted scale, this noise level would be approximately 79 dBA, which is categorized as a loud to very loud noise. Engine noise produced in the immediate vicinity of the launch site tends to be low frequency sound of short duration (i.e., less than one minute). Noise from pre-launch helicopter overflights would be significantly lower than engine noise levels but last much longer during the pre-launch phase. Noise caused by an explosion would be of shorter duration than the engine noise but a much higher magnitude.

Noise at the launch site from engine noise, noise from pre-launch helicopter overflights, or noise caused by the explosion of a launch vehicle, could cause physiological or behavioral effects in any wildlife species present at or near the launch site. Effects could include triggering a startle response, causing hearing damage or impairment, masking biologically significant sounds such as predators, provoking temporary or permanent emigration, affecting growth and resistance to disease, reducing energy efficiency, causing mortality, or inducing reproductive failures in wildlife in the immediate vicinity of the launch site. Triggering a startle response can alter predator/prey interactions by alerting predators to prey locations or by leaving eggs or young temporarily vulnerable to predators, and can cause damage to the animal, its eggs, or its young (USFWS 1999).

Terrestrial mammals in the project vicinity, including special-status species (e.g., bats), are not expected to suffer any long term impacts, such as a permanent hearing loss, from the noise generated during launches from SLC-3W. Terrestrial mammals, such as bats, kangaroo rats, coyote, gray fox, bobcat, and mountain lion, known to have reasonably good low-frequency hearing and potentially occurring near the launch site, may suffer temporary, short-term (10 to 48 hour) impacts, such as hearing deficits and temporary hearing threshold shifts. Small- and medium-sized animals experiencing hearing impairments as a result of launch noise could suffer a small decrease in population density due to increased susceptibility to predators. However, actual adverse effects from these hearing impairments have not been documented and are not likely to be serious, since the affects of temporary hearing impairment probably would disappear within 10 to 48 hours. Based on the above information, less than significant impacts on terrestrial mammals would be generated from launch noise during the launch of falcon vehicles from the SLC-3W.

Since most terrestrial birds are relatively insensitive to sounds below 100 Hz they are unlikely to experience any auditory damage from launch noise generated during the launch. Noise at the launch site from engine noise or noise caused by an explosion, could however, cause a short-term startle response which could disrupt nesting, feeding or roosting. Prolonged noise from pre-launch helicopter overflights could also disrupt nesting or roosting or alter predator/prey interactions (as discussed above). Based on studies of the American kestrel (U.S. Air Force 1993), it appears that special-status and other diurnal raptors, such as the peregrine falcon, ferruginous hawk, northern harrier, Cooper's hawk, and loggerhead shrike, probably would not be affected by noise from either a launch or subsequent focused sonic boom (see below). Based on the above information, it appears that there would be no significant impact to most terrestrial birds from launch noise generated during the launch of vehicles from the SLC-3W.

Elevated noise levels generated during launches could affect special-status reptiles (e.g., southwestern pond turtle, two-striped gartersnake) in the project vicinity by invoking a startle response. These species would likely treat the disturbance caused by elevated noise in much the same way as they respond to the approach of a potential predator, by diving and remaining below the water's surface. If this startle response occurred, it would likely reduce an individual's exposure to high decibel sound because water would attenuate the sound to some degree. Therefore, less than significant impacts on these species would occur from noise generated during the launch of vehicles from SLC-3W.

Several federally listed species could be affected by noise at the launch site that is associated with the Proposed Action, including the federally listed California red-legged frog, California brown pelican, western snowy plover, California least tern, southwestern willow flycatcher, and southern sea otter as discussed below. Other marine mammals, also protected by the Marine Mammal Protection Act (e.g., harbor seals, California sea lion), could be affected by noise at the launch site are also discussed below.

California red-legged frog. Elevated noise levels generated during launches could affect California red-legged frogs by invoking a startle response. California red-legged frogs would likely treat the disturbance caused by elevated noise in much the same way as they respond to the approach of a potential predator, by diving and remaining below the water's surface (USFWS 1999). If this startle response occurred, it would likely reduce an individual's exposure to high decibel sound because water would attenuate the sound to some degree.

Within a Biological Opinion issued by the USFWS regarding the Atlas II Launch Program at SLC-3, the USFWS concluded that the Atlas program would not result in the loss of the entire California red-legged frog population in the area of Bear Creek (USFWS 1999). They also concluded that any losses of California red-legged frogs in the Bear Creek area would have an almost negligible impact on the entire population of California red-legged frogs. This conclusion was based on the fact that California red-

legged frogs were not discovered in the area of Bear Creek until August 1999. Ms. Sue Christopher sampled Bear Creek in 1996, and no California red-legged frogs were present at that time (Christopher 1997). It is anticipated that the California red-legged frogs found in 1999 came into the area somewhat recently and could re-colonize the area once again in the future (USFWS 1999).

California brown pelican. Launch noise is expected to alter the behavior of brown pelicans that are located in the area from the Lompoc landing to the boathouse, although to a limited degree. Launch noise may affect the feeding and roosting activities of brown pelicans off the coast of Vandenberg AFB by causing a short-term startle effect. However, within the Biological Opinion issued for the Atlas II Launch Program, the USFWS concluded that that program was not expected to result in the loss of the roosting brown pelican population on Vandenberg AFB (USFWS 1999).

In addition, roosting brown pelicans were counted at the Vandenberg Harbor Breakwater, Rocky Point, Point Arguello, Point Pedernales, and the Santa Ynez River mouth immediately prior to and immediately after the 8 September 2001 Atlas IIAS launch out of SLC-3E; on the day of the launch behavioral observations of a roosting flock of brown pelicans at the Santa Ynez river mouth were also collected. During the launch, none of the individuals within the flock exhibited any reaction to the launch noise and no interruption in their activities was observed (e.g., preening, resting). Finally, there was no evidence of injury, mortality, or abnormal behavior of any brown pelicans as a result of the Atlas IIAS launch (SRS Technologies 2001).

Western snowy plover. Launches that occur at SLC-3 are approximately one mile from western snowy plover habitat along the beach, and launch vehicles fly directly over the habitat. Data obtained from SLC-6 supports other monitoring results that western snowy plovers crouch and observe objects, such as launch vehicles that "mimic" avian predators (USFWS 1999). The Biological Opinion for the Atlas II Program concludes that launch noise generated by the Atlas II Program could generate impacts on western snowy plovers and result of take of the all nesting individuals near SLC-3 through harassment by noise and light from the launch. The Biological Opinion concludes, however, that this take is not likely to jeopardize the species during launch activities at SLC-3. Pre- and post-launch population counts of western snowy plovers at Surf Beach, and behavioral observations immediately prior to, during, and after the 8 September 2001 Atlas IIAS launch out of SLC-3E, resulted in no behavioral responses to the launch noise and no interruption in their activities (e.g., foraging, preening, resting) (SRS Technologies 2001). Snowy plovers also showed no behavioral response to helicopter overflights conducted for the launch (although due to dense fog, the helicopter was not visible). Finally, there was no evidence of injury, mortality or abnormal behavior of any snowy plovers as a result of the Atlas IIAS launch (SRS Technologies 2001).

California least tern. California least terns are found at the Purisima site near SLC-2, which is approximately six miles from SLC-3E. Launch noise may also alter the behavior of California least terns found within and south of the Santa Ynez River mouth. According to the Biological Opinion for the Atlas II Launch Program, impacts generated by the Atlas II Launch Program were anticipated to be similar to impacts generated by launches at SLC-4 which have not generated any observable impacts on California least terns (USFWS 1999).

Southwestern willow flycatcher. Launch noise may alter the behavior of southwestern willow flycatchers in the Santa Ynez River area, likely causing them to flush from the area. Previous monitoring from other launches has shown no observable impact to the species from space launches. If flycatchers did occur in Bear Creek, launch noise would be expected to alter the behavior of birds by causing them to flush. This species has not been previously found in Bear Creek, although it provides suitable habitat for the species (USFWS 1999).

Southern sea otter. Launch noise, including sonic booms (see below), is expected to alter southern sea otter behavior of individuals occurring in the area from the Lompoc landing to the boathouse, by most likely causing a short-term startle effect (USFWS 1999). Impacts of noise on southern sea otters south of Spur Road, in the area where noise from SLC-3 would be the greatest have not been studied. However, a study of the Delta II Rocket launch from SLC-2W on 6 November 1998, concluded that the launch did not appear to significantly affect the number or activities of a resident population of southern sea otters using the areas around Purisima Point and Spur Road (USFWS 1999).

Other marine mammals. Along the Vandenberg AFB coast, launch noises are expected to impact principally harbor seals, as other pinnipeds (e.g., California seal lions and northern elephant seals) are known to haul out at these sites only infrequently and in significantly smaller numbers. Launch noise can be expected to cause a startle response and flight to water for those harbor seals, California sea lions and other pinnipeds that are hauled out on the coastline of Vandenberg AFB. An existing Letter of Authorization from the NOAA Fisheries (formerly National Marine Fisheries Service) currently authorizes the incidental take (by harassment) of several marine mammal species including the Pacific harbor seal, California sea lion, northern elephant seal, and northern fur seal for up to 20 launches of Titan, Lockheed Martin, Delta II, Taurus, Atlas, or Minotaur rockets out of Vandenberg AFB.

Observations of harbor seals were conducted immediately prior to, during, and immediately after launches of the Atlas IIAS out of SLC-3E on 19 December 1999 and 8 September 2001 (SRS Technologies 2000 and 2001). The 1999 observations were conducted at Flat Iron Rock, while 2001 observations were made at both Flat Iron Rock and Weaner Cove; both are regular haul-out sites for harbor seals at Vandenberg AFB and they occur approximately 9.7 km southeast of SLC-3E. During both launches, there was no evidence of injury, mortality, or abnormal behavior to any harbor seals as a result of the Atlas IIAS launch (SRS Technologies 2000 and 2001).

Summary of Engine Noise Impacts on Federally Listed Species. Based on the conclusions contained within the Biological Opinion for the Atlas II Program from the USFWS and existing Letter of Authorization and Incidental Take Permit from the NOAA Fisheries, as well as results from recent launch monitoring of species' populations, noise generated during launch of the Atlas IIAS generates less than significant impacts on populations of the California red-legged frog, California brown pelican, western snowy plover, California least tern, and marine mammals protected by the Marine Mammal Protection Act. Due to the distance of SLC-3 from the closest nesting areas and results of past launch monitoring, impacts of the Atlas II program on the southwestern willow flycatcher are also less than significant. Finally, based on the previous monitoring at SLC-2W, impacts of the Atlas II program on the southern sea otter generated by launch noise at SLC-3 are anticipated to be less than significant.

Despite the closer proximity of SLC-3W to some sensitive species' locations (e.g., western snowy plover, California least tern, marine mammals) than SLC-3E, A-weighted launch noise levels and noise impacts on wildlife from the Falcon Launch Vehicle Program would be less than those generated under the Atlas IIAS Program (see Section 4.2, Noise).

The current space launch schedule for Vandenberg AFB forecasts one to two in 2004, two to three in 2005, and three in 2006. Even with adding a maximum of 2 to 3 projected launches under the Falcon Launch Vehicle Program, the total number of launches per year at Vandenberg AFB would be within the 20 launches per year assumed in the Letter of Authorization issued by NOAA Fisheries.

Given that (1) launch-related noise impacts would be infrequent with a maximum of 2 to 3 per year, (2) at least one month must be scheduled between each launch, and (3) noise impacts would be less than those

generated under the Atlas II program, engine noise impacts on federally listed species would be less than significant.

Finally, measures described in Section 2.1.18, including monitoring of noise levels and wildlife responses to launches, would be implemented for the Falcon Launch Vehicle Program to ensure that operation of the program would not adversely affect sensitive species.

Range. Within the flight trajectory of the Falcon vehicle, noise would be generated from sonic booms over San Miguel Island, Santa Rosa Island, and Santa Cruz Island (Figures 4-5 through 4-7) (see Section 4.2, Noise). Modeling predicts that the focused sonic boom for the Falcon Launch Vehicle would reach maximum peak overpressures of 2.65 psf, 10.14 psf, and 7.05 psf for the 160-degree, 175-degree, and 190-degree flight azimuths, respectively; these overpressures would not occur over the Channel Islands however. Maximum overpressures over the Channel Islands would be: 2.3 psf over San Miguel Island under the 160-degree azimuth, 1.0 psf over Santa Rosa Island and Santa Cruz Islands under the 160-degree azimuth, 2.0 psf over Santa Cruz Island under the 175-degree azimuth, and 1.0 psf over Santa Cruz and Santa Rosa Islands under the 190-degree azimuth. The 2.3 psf and 2.0 psf overpressures would occur under high winds in December. When converted to an A-weighted scale, sonic booms noise levels would range from 65 to 75 dBA over the Channel Islands under mean December winds and the 175-degree azimuth would produce the highest noise levels over the Channel Islands (see Section 4.2, Noise). Prior to each launch, sonic boom noise levels would be modeled using atmospheric conditions that would be representative of that launch.

Noise generated from sonic booms associated with the launch would be of sufficient intensity to potentially result in behavioral effects on terrestrial and marine biota in and near these islands, including special-status marine birds and marine mammals. Sonic booms produced by the flight of launch vehicles over San Miguel Island, Santa Rosa Island, and Santa Cruz Island may negatively affect brown pelicans, western snowy plovers, pinnipeds, southern sea otters, and other marine mammals and wildlife in this area. A short-term startle effect could be generated, which could disrupt the feeding and roosting activities of brown pelicans and other marine birds off the coast of the islands. Southern sea otters, pinnipeds, and other marine mammals may also demonstrate a short-term startle effect.

Observations of harbor seals, elephant seals, and California sea lions were conducted on San Miguel Island for potential sonic boom impacts immediately prior to, during, and immediately after the 8 September 2001 launch of the Atlas IIAS out of SLC-3E (SRS Technologies 2001) (with predicted sonic boom levels of 4 psf over the northern tip of Santa Cruz Island [see Appendix E]). During this monitoring, there was no evidence of injury, mortality, or abnormal behavior to any of these marine mammals as a result of the Atlas IIAS launch (SRS Technologies 2001).

Summary of Sonic Boom Noise Impacts on Biological Resources. Based on the studies discussed above and the fact that the Falcon Launch Vehicle Program would generate lower sonic boom noise levels than the Atlas IIAS (see Section 4.2, Noise), sonic boom impacts on brown pelicans, western snowy plovers, southern sea otters, and other marine mammals and wildlife occurring in the Channel Islands from the Falcon Launch Vehicle Program would be less than those generated under the Atlas II program.

Even with adding a maximum of 2 to 3 projected launches under the Falcon Launch Vehicle Program, the total number of launches per year at Vandenberg AFB would be within the 20 launches per year assumed in the Letter of Authorization issued by NOAA Fisheries.

Given that, (1) launch-related noise impacts would be infrequent with a maximum of 2 to 3 per year, (2) at least one month must be scheduled between each launch, and (3) noise impacts would be less than

those generated under the Atlas II program, sonic boom noise impacts on biological resources would be less than significant.

Finally, measures described in Section 2.1.18, including monitoring of noise levels and wildlife responses to launches, would be implemented for the Falcon Launch Vehicle Program to ensure that operation of the program would not adversely affect sensitive species above.

Exhaust Cloud

An exhaust cloud would be formed by the combination of the exhaust plume and evaporation and subsequent condensation of the deluge water applied during lift-off. The exhaust plume would consist of steam only and would contain mostly carbon dioxide which, when combined with deluge water, would create carbonic acid. The carbonic acid forms a mild acid (similar to a carbonated beverage) by breaking down into bicarbonate and hydrogen ions. The breakdown of carbonic acid into bicarbonate and hydrogen ions would be the same as the natural process that occurs during the hydrologic cycle. Therefore, the steam is anticipated to have the same pH as rainwater.

Most of the steam from the exhaust plume is expected to evaporate, however, some water particles could reach the ground near the launch pad and within Bear Creek Canyon, where California red-legged frogs are located.

Because plant and wildlife exposure to steam from the exhaust plume is anticipated to be minimal and the fact that its pH is expected to be the same as that of rainwater, it is not anticipated that steam from the exhaust plume would have a negative impact on biological resources, including the California red-legged frog.

All deluge wastewater generated from the proposed project would be immediately disposed of off-site after the launch and, therefore, would not impact biological resources.

Heat and Fire Impacts

Heat and fire from rocket launches could potentially impact nonnative grassland habitat during the launch. However, heat and fire would be suppressed on the launch pad using a deluge water system, and any fire would be contained within the existing flame bucket.

No native plant communities occur within the boundaries of SLC-3W; therefore, heat and fire during the launch would not impact any native plant species or native plant communities. Because no special-status species or proposed or designated critical habitat exists at the launch site, impacts on these resources would also not be generated from the Proposed Action.

Only common wildlife species that frequent nonnative grassland habitat (e.g., deer, ground squirrel, white-crowned sparrow) have been observed, or are expected to occur, at or adjacent to the launch site. Most of these common wildlife species are large and mobile would likely move to other locations for foraging during launch disturbances. Because these species are common, displacement of the species from SLC-3W or adjacent areas would have a less than significant impact on their populations at Vandenberg AFB.

Launch Mishap

If a launch malfunction or failure occurred, individuals of the special-status beach layia, located near Coast Road approximately 1.3 miles west of SLC-3 (USFWS 1999), and other plant and wildlife species, including special-status species in the vicinity of SLC-3 (e.g., California red-legged frog, southwestern pond turtle, and two-striped garter snake in Bear Creek Canyon) and under the flight range of the Falcon (marine mammals and seabirds), could be negatively affected. If a malfunction or failure occurred at or near the launch pad, the resulting explosion could disperse unburned fuels and other hazardous materials. For the purposes of this EA, the area of potential effect for an on-pad mishap was assumed to be within a 60-meter radius based upon the design of the Falcon and its fuel usage. A fire at SLC-3W could travel to the nearby location of the beach layia population (less than 2 miles from SLC-3W) and negatively impact the population and other populations of special-status wildlife species (USFWS 1999). Debris falling from the vehicle could hit terrestrial or marine wildlife or cause a startle response or other behavioral effects. Specifications for the reliability of the launch vehicles would be established as a result of a thorough safety review for the Falcon Launch Vehicle Program that is currently in progress, however, the reliability would be at least 95 percent (or less than a five percent chance of a launch mishap). With implementation of all required federal, state, county, and Air Force safety procedures, the probability of a mishap is low; therefore, potential impacts on biological resources from a mishap are not expected.

Summary of Consultation and Permit Requirements for Biological Resources

Coordination with the USFWS for Section 7 consultation pursuant to the federal ESA is required, and being conducted, for the Falcon Launch Vehicle Program for potential project effects on the California red-legged frog, California brown pelican, western snowy plover, California least tern, southwestern willow flycatcher, and southern sea otter. In addition, coordination with NOAA Fisheries, to be included on the Letter of Authorization and Incidental Take Permit for Harassment of Marine Mammals at Vandenberg AFB, is also required, and being conducted, for the Falcon Launch Vehicle Program.

4.3.1.2 Refurbishment Impacts

Refurbishment at SLC-3W would impact only nonnative grassland habitat during re-trenching activities for the reinstallation of utilities to Building 770 and possibly by resurfacing the existing dirt access road to the site. No native plant communities would be impacted by refurbishment of SLC-3W. Due to the installation of exclusion netting, birds protected under the Migratory Bird Treaty Action and Executive Order 13186, and special-status bat species, would not occur in Building 770 during refurbishment activities. Because no special-status species or proposed or designated critical habitat exist at the launch site, impacts on these resources would not be generated from the Proposed Action during refurbishment activities.

Only common wildlife species that frequent nonnative grassland habitat (e.g., deer, ground squirrel, white-crowned sparrow) have been observed or are expected to occur at the launch site during refurbishment. Most of these common wildlife species are mobile and would move to other locations for foraging. Because these species are common, displacement of the species from SLC-3W would have a less than significant impact on their populations at Vandenberg AFB.

4.3.2 Alternative 1

4.3.2.1 Operation Impacts

The deluge water system is expected to provide fire suppression, however, it is feasible to launch the Falcon without the use of the deluge water system and still contain fire generated from a launch within the existing flame bucket. Therefore, the risk of fire would still remain low under Alternative 1, and potential impacts on biological resources due to a fire would remain less than significant.

The deluge water system is expected to reduce engine noise levels by suppressing combustion noise from the post-burning of fuel-rich combustion products in the atmosphere during a launch, although direct noise measurements are not available to indicate how much a deluge water system attenuates noise. Therefore, engine noise levels are expected to be slightly higher for the Falcon than under the Proposed Action. However, because no special-status biological receptors would occur at the launch pad, noise impacts on biological resources would remain less than significant under Alternative 1.

4.3.2.2 Refurbishment Impacts

Under Alternative 1, the deluge water system would not be built. However, construction of the deluge water system was not anticipated to impact any biological resources; therefore, refurbishment under Alternative 1 would have identical impacts on biological resources as the Proposed Action and impacts would be less than significant.

4.3.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore there would be no operational or refurbishment impacts on biological resources.

4.3.4 Mitigation Measures

Because less than significant impacts on biological resources would occur, no mitigation measures are recommended.

4.4 CULTURAL RESOURCES

Impacts on cultural resources would be considered significant if they resulted in disturbance or loss of value or data that qualify a site for listing in the National Register; if there was substantial disturbance or loss of data from newly discovered properties or features prior to their recordation, evaluation, and possible treatment; or if the project substantially changed the natural environment or access to it such that the practice of traditional cultural or religious activities was restricted.

4.4.1 Proposed Action

4.4.1.1 Operation Impacts

Archaeological Sites

Three isolated prehistoric artifacts are located within the APE of the Falcon Launch Vehicle Program (VAFB-ISO-327, -328, and -333). None of these isolated artifacts is located within the SLC-3W boundary and thus, would not be affected by normal launch activities at the launch site. In the event of an

on-pad mishap, whereby the launch vehicle explodes upon takeoff, there is the potential for debris to impact these isolated artifacts within the APE. In addition, an on-pad mishap could cause a range fire and the fire or subsequent efforts to fight the fire could impact the artifacts within the APE and possibly beyond the APE if the fire becomes uncontained. However, due to the low probability of a mishap and subsequent damage to these artifacts, impacts on these resources due to operation of the Falcon Launch Vehicle Program would be less than significant.

Traditional Resources

Normal launch operations at SLC-3W have the potential to interfere with current use of the vicinity by Chumash descendants. In the event of an on-pad mishap, there is also the potential for debris, fires, or fire fighting activities to impact these resources within the APE. However, the probability of a mishap and subsequent damage to these resources is low. The 30 CES/CEVPC will consult with Tribal Elders at the Santa Ynez Band of Chumash Indians regarding reuse of SLC-3W to ensure that these potential impacts are reduced to less than significant levels.

4.4.1.2 Refurbishment Impacts

Archaeological Sites

Three isolated prehistoric artifacts are located within the APE of the Falcon Launch Vehicle Program (VAFB-ISO-327, -328, and -333). None of these isolated artifacts is located within the SLC-3W boundary and thus, would not be affected by ground disturbing activities associated with refurbishment of the facilities. VAFB-ISO-328 and -327 are in the vicinity of the former security fence around the western edge of SLC-3W. However, because the security fence would not be reinstalled and no other facilities or activities are planned in the vicinity of the isolated artifacts, these resources would not be affected by refurbishment of the SLC-3W facilities.

Traditional Resources

Because traditional resources used by Chumash descendants are not located within the SLC-3W boundary, they would not be affected by ground disturbance associated with refurbishment of the facilities. Because refurbishment is temporary in nature, noise associated with these activities would also not significantly impact these resources or use of these resources. Therefore, refurbishment impacts on traditional resources would be less than significant.

Historic Buildings and Structures

The entire SLC-3 complex, including both SLC-3W and SLC-3E, has been determined eligible for the National Register by the Air Force, in consultation with the SHPO. In the early 1990s, a proposed Atlas II project at SLC-3 was considered an adverse effect to the historic property. To mitigate that effect, a Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) study was undertaken in 1993, resulting in a comprehensive, four-volume document. A Memorandum of Agreement, prepared in 1993, addressed the mitigation issue for the Atlas II project.

Subsequently, SLC-3 was considered for the Evolved Expendable Launch Vehicle (EELV), which was again considered an adverse effect. No additional documentation was required to mitigate the impacts, and a new Memorandum of Agreement was prepared. That agreement stipulates that "the HABS/HAER recordation of SLC-3 . . . has satisfactorily taken into account the effects of the undertaking on SLC-3, and that no other measures to minimize or mitigate the effects of the undertaking on SLC-3 are required."

Finally, a Programmatic Agreement signed in July 2002 between Vandenberg AFB and the SHPO for the management of Cold War resources states that "only the complete demolition of SLC-3 will require a statutory Section 106 consultation in the future." Because the impacts on SLC-3 from the Falcon Launch Vehicle Program do not exceed those that were proposed under the EELV and do not involve demolition of the facility, refurbishment impacts on the SLC-3W facilities would be less than significant and no additional effort to minimize or mitigate the impacts from the Falcon Launch Vehicle Program would be necessary.

4.4.2 Alternative 1

4.4.2.1 Operation Impacts

Operation impacts on cultural resources under Alternative 1 would be identical to those from operation of the Proposed Action; therefore operation impacts on cultural resources would be less than significant.

4.4.2.2 Refurbishment Impacts

Refurbishment impacts on cultural resources under Alternative 1 would be identical to those from refurbishment activities under the Proposed Action; therefore refurbishment impacts would be less than significant.

4.4.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, there would be no operational or refurbishment impacts on cultural resources.

4.4.4 Mitigation Measures

Because less than significant impacts on cultural resources would occur, no mitigation measures are recommended.

4.5 AIR QUALITY IMPACTS

4.5.1 Proposed Action

The following sections describe potential air quality impacts generated from the Proposed Action. Potential air emissions are estimated under a "worst-case scenario" for the proposed project which is defined as air emissions from the most launches of the Falcon vehicle physically possible in a year – or six launches per year. Although six launches are not proposed for the program, this assumption was made to conduct a conservative air conformity analysis for the Falcon Launch Vehicle Program.

The Proposed Action would have a significant impact on regional air quality if the worst-case scenario emission estimate exceeded current federal and state air quality standards within the Santa Barbara Air Basin. This exceedance would occur if calculated long- and short-term impacts from the direct and indirect emission sources were significant when compared with the federal and state standards.

Long-term emissions from the Falcon Launch Vehicle Program would result from operation of pre- and post-launch activities, vehicle launches, and the workers' commutes. Short-term emissions would result from the refurbishment of SLC-3W and supporting infrastructure (e.g., construction). The potential air

impacts from operation and refurbishment activities are discussed in Sections 4.5.1.1 and 4.5.1.2, respectively.

A conformity analysis was performed to satisfy the conformity requirements set forth by District Rule 702 *General Conformity* and is contained in Appendix C. The conformity assessment in Appendix C contains calculations and assumptions used in estimating project emissions. The total direct and indirect emissions from operation and construction under the worst-case scenario would not exceed federal *de minimis* conformity threshold values for ozone precursors (nitrogen oxides and reactive organic compounds). In addition, total emissions for each criteria pollutant from the worst-case scenario would be less than 10 percent of SBCAPCD 1996 Emission Inventory for Santa Barbara County. The worst-case scenario, and therefore the Proposed Action, would be deemed *de minimis* and would not be regionally significant, and would be exempt from further conformity requirements. This determination is in accordance with conformity requirements set forth in 40 CFR (b), (c), and section 176 (c) (4) of the Clean Air Act, and Rule 702 *General Conformity.* Therefore, air quality impacts under the Proposed Action would be less than significant.

4.5.1.1 Operation Impacts

Lower Atmosphere

A maximum of six Falcon launches per year would take place under the worst-case scenario. All launches would include a payload, therefore, test launches would not occur. Resulting annual emissions from operation of the Proposed Action are discussed below, including those from:

- Vehicle preparation and transport;
- Vehicle fueling;
- Wet tests and vehicle launches;
- Point and stationary sources; and
- Mobile sources.

Vehicle Preparation and Transport. District Regulation II for permitting must be followed to ensure that preparation and assembly processes for the Falcon Launch Vehicle Program are properly addressed. In addition, use of toxic chemicals must be addressed following the Title 17 CCR 93000 for the protection of air quality. Quantifiable emissions resulting from vehicle preparation and transport to SLC-3W would be generated from mobile sources only (no point source or stationary sources were assumed), from the transport of the first and second stages and payload from the Santa Barbara County line, California, to SLC-3W at Vandenberg AFB.

Air pollutants resulting from transporting the first and second stages, and payload would mainly include oxides of nitrogen and PM_{10}. Annual mobile emissions resulting from vehicle preparation and transport activities are summarized in Table 4-4, assuming six launches per year.

Table 4-4
Emissions from Vehicle Preparation and Transport

Activity	VOCs	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Mobile emissions from vehicle preparation and transport (tons per year)	0.01	0.09	0.05	0.00	0.02

Vehicle Fueling. The Falcon would use LOX and RP-1 as fuel. Quantifiable emissions from vehicle fueling operations are mobile emissions only, and are generated during the transport of the fuel to SLC-3W. Annual emissions resulting from transporting fuel to SLC-3W six times per year are summarized in Table 4-5, assuming six launches per year.

Table 4-5
Emissions from Vehicle Fueling

Activity	VOCs	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Transporting fuel to SLC-3W (tons per year)	0.00	0.04	0.02	0.00	0.01

During the transfer of fuel from the transport truck to the storage tank and from the storage tank to the first and second stages, any emissions of LOX would be negligible and would not have a negative air quality impact. Emissions of RP-1 during fueling activities under the EELV Program were estimated in the final Environmental Impact Statement prepared for the EELV Program (published in 1998). The estimated emissions amounted to less than 50 pounds of RP-1 per year. Emission of RP-1 under the Falcon Launch Vehicle Program during fueling activities is anticipated to be much less due to the smaller-size vehicle. In addition, all fuel transfers would be performed using zero-leak quick-disconnect fittings, and District Regulation II for permitting would be followed to ensure proper storage and handling of RP-1. Therefore, air emissions resulting from transferring LOX and RP-1 from the truck tank to storage tanks, and from storage tanks to the first and second stages, would have no significant contribution to the overall emissions generated from the operation phase of the Proposed Action.

Wet Tests and Vehicle Launches. Each launch is considered to be a discrete event that generates short-term impacts on the local air quality. Long-term effects resulting from the launches are not expected because the launches are infrequent and the resulting emissions are rapidly dispersed and diluted by winds in the troposphere.

After final systems checkout before each launch, there would be a mission rehearsal without propellants on board (dry) plus a mission rehearsal with propellants loaded on the vehicle (wet) to verify full launch readiness. It was assumed, under the worst-case scenario, that one wet test would be performed per launch. Annual emissions for the wet test and the actual launch of the vehicle are calculated in Appendix C using the results of actual measurement of emission factors from the Falcon engine. Table 4-6 summarizes the results of these emission calculations.

Table 4-6
Emissions from Wet Tests and Vehicle Launch
(tons per year)

Activity	VOCs	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Wet test of six Falcon vehicles	0.00	0.00	19.08	0.00	0.00
Launch of six Falcon vehicles	0.00	0.00	571.32	0.00	0.00

Point and Stationary Sources. Point and stationary sources, which are stationary processes and maintenance sources, include natural gas combustion from water and space heating boilers, painting and coating activities, solvent and adhesives use, and internal combustion engines. There will be no heated spaces. Portable restrooms with instant water heaters will be used, therefore no boiler emissions would be generated. Emissions resulting from point and stationary sources associated with the operation of the Proposed Action would include the following activities:

- Abrasive blasting;
- Coating and painting the launch structure after each launch; and
- Solvent-cleaning parts after each launch.

Point and stationary source emissions for the above referenced activities were estimated using approved methods and include potential emissions of criteria pollutants. These emissions are summarized in Table 4-7 and details regarding their estimation are included in Appendix C.

Table 4-7
Point Source Emissions

Activity	VOCs	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Point sources (tons per year)	0.13	0.56	0.12	0.04	0.76

Source: U.S. Air Force 1998a

Privately-Owned Vehicles and Maintenance. Mobile source emission activities from the worst-case scenario are identified as follows:

- Daily worker commute;
- Delivery of deluge wastewater and domestic wastewater off-site after each launch; and
- Delivery of support equipment such as a mounting crane.

Annual emissions from privately-owned vehicles and maintenance of SLC-3W during operation of the worst-case scenario are summarized in Table 4-8.

Table 4-8
Mobile Source Operation Emissions

Activity	VOCs	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Mobile Emissions from Privately-owned Vehicles and Maintenance Vehicles (tons per year)	0.20	0.21	3.41	0.00	0.02

Upper Atmosphere

The lower troposphere experiences removal of most rocket emissions within approximately one week. The removal of the emissions takes place during rainfall and by vertical air movement that draws the emissions to the ground.

In the environmental impact statement for the EELV Program (U.S. Air Force 1998a), it was determined that emissions from any ozone-depleting substances would not be produced in the stratosphere. Therefore, the emissions from the worst-case scenario would not have any significant impacts in the stratospheric ozone layer. A process evaluation of the EELV Program and its comparison to the worst-case scenario is presented in Appendix C to demonstrate that the worst-case scenario would have a lesser impact on air quality in the upper atmosphere than the EELV Program.

4.5.1.2 Refurbishment Impacts

The Proposed Action would involve refurbishment of SLC-3W for launch activities. The infrastructure requiring refurbishment would include refurbishment of the existing building, installation of concrete pads for consumables, and reinstallation of utilities. Emissions resulting from the refurbishment efforts would be produced by construction equipment and workers' commute. The activities that would generate air emissions during refurbishment are as follows:

- Hauling of equipment;
- Grading and trenching;
- Backfilling and soil compacting;
- Asphalt paving of the entrance road; and
- Refurbishment of Building 770.

The pollutants resulting from the operation of motor vehicles used during site preparation include the federal and state criteria pollutants nitrogen oxides, sulfur oxides, carbon monoxide, PM_{10}, and VOCs (also referred to as reactive organic compounds and hydrocarbons). Annual emissions resulting from mobile transport of construction equipment to and from SLC-3W and from site preparation are presented in Table 4-9.

Table 4-9
Refurbishment Activities Emissions
(tons)

Activity	VOCs	Nitroen Oxides	Carbon Monoxide	Sulfur Oxides	PM_{10}
Refurbishment emissions from site preparation and mobile emissions (tons per year)	0.44	3.02	3.01	0.29	11.79

4.5.2 Alternative 1

Under Alternative 1, a deluge water system would not be used. Air quality impacts associated with transport of deluge wastewater off-site would not occur. Therefore, air quality impacts under Alternative 1 would be less than those under the Proposed Action and air quality impacts would be less than significant.

4.5.3 No-Action Alternative

Under the No-Action Alternative, refurbishment and operation of the proposed project would not occur; therefore, there would be no air quality impacts.

4.5.4 Mitigation Measures

Because less than significant impacts on air quality would occur, no mitigation measures are recommended.

4.6 HAZARDOUS MATERIALS/HAZARDOUS WASTE

A project may result in a significant impact to hazardous materials/hazardous waste if it increases the potential for exposure to hazardous materials/waste or increases the likelihood of a hazardous materials release to the environment. Impacts on hazardous materials and waste management would also be considered significant if they resulted in noncompliance with applicable regulatory guidelines or increased the amounts generated beyond available waste management capacities.

4.6.1 Proposed Action

4.6.1.1 Operation Impacts

Hazardous Materials

All hazardous materials would be handled and disposed of per the requirements established by EWR-127-1, Section 3.10 (Hazardous Materials) and Section 6.10 (Hazardous Materials Operations), and per the Hazardous Materials Contingency Plan developed for the Falcon Launch Vehicle Program. In addition, the Falcon Launch Vehicle Program would comply with 29 CFR Part 1910.119 and Air Force Occupational Safety and Health 91-119 for all Process Safety Management-related activities. A California Business Plan would be submitted to the Santa Barbara County Fire Department for storage of LOX, RP-1, liquid nitrogen, and gaseous helium at SLC-3W. In addition, a SPCC Plan would be prepared and kept onsite for the ASTs for RP-1, LOX, liquid nitrogen, and gaseous helium, and the AST

for RP-1 would be registered with the SWRCB. Finally, any hypergolics associated with payloads (usually integral to a payload package) would be processed at an approved payload processing facility such as those operated by Spaceport Systems International or Astrotech on Vandenberg AFB, and once present at SLC-3W, Space X would implement proper handling procedures for payloads containing hypergolics. Because all applicable federal, state, county, and Air Force rules and regulations would be followed for the proper storage, handling, and usage of hazardous materials under the Falcon Launch Vehicle Program, less than significant impacts on hazardous materials management should occur under the Proposed Action.

Space X would prepare an Emergency Response Plan for the Falcon Launch Vehicle Program in compliance with the Vandenberg AFB Hazardous Materials Emergency Response Plan to ensure that proper response in the event of a spill of hazardous materials. In addition, in the event of a spill, Space X would also complete a Community Awareness and Emergency Response reporting form and submit it to Santa Barbara County per local Santa Barbara County hazardous material and hazardous waste spill reporting requirements. Because all applicable federal, state, county, and Air Force rules and regulations would be followed for the proper response to an accidental spill of hazardous materials under the Falcon Launch Vehicle Program, less than significant impacts on hazardous materials emergency response would be generated under the Proposed Action.

During impact of the first stage with the ocean, a minute amount of residual fuel would be released into the ocean off the coast of Mexico. Approximately 8 gallons of LOX and 5 gallons of RP-1 would be released from the expended Falcon first stage into the ocean on impact. The LOX residue would dissipate as gaseous oxygen while the RP-1 residue would likely float on the surface of the ocean and dissipate. Release of this fuel would not be prohibited or require a permit under a federal, state, local, or Air Force regulation, as the volume of fuel released is a very small amount, impacts on water quality from release of this hazardous material would be less than significant.

Hazardous Waste

During operation of the Falcon Launch Vehicle Program, all hazardous waste would be handled and disposed of per the requirements established by EWR-127-1, Section 3.10 (Hazardous Materials) and Section 6.10 (Hazardous Materials Operations) and identified in the Hazardous Waste Management Plan developed for the Falcon Launch Vehicle Program.

Operation of the Proposed Action would potentially generate the following classes of hazardous waste at SLC-3W:

- Ignitable RCRA wastes;
- Toxic U.S. EPA wastes;
- Commercial Chemical Products (U) RCRA wastes;
- Process wastes (F-listed);
- Characteristic wastes;
- State regulated wastes (Non-RCRA); and
- Universal wastes.

Launch deluge wastewater generated by the Proposed Action would normally be categorized as industrial wastewater; however, this wastewater would be characterized to ensure that it would not be considered a hazardous waste. If so, it would be properly handled and disposed of.

All hazardous wastes generated would be labeled with a unique U.S. EPA identification number under which it is transported, treated, and disposed, as outlined in 40 CFR section 262.12. The Falcon Launch Vehicle Program would operate under the 90-day hazardous waste collection rule. Hazardous waste would be disposed of at any one of the three hazardous waste landfills in California: the Chemical Waste Management facility in Kettleman City, or the Clean Harbors facilities in the city of Buttonwillow or city of Westmoreland, depending upon the characteristics of the hazardous waste.

Because all applicable rules and regulations regarding hazardous waste (RCRA and non-RCRA) storage, treatment, and disposal, and associated reporting requirements, would be adhered to under the Proposed Action, less than significant impacts on hazardous waste management would occur under operation of the Falcon Launch Vehicle Program. In addition, hazardous waste streams anticipated to be generated by the Falcon Launch Vehicle Program are typical of other hazardous waste streams in California. Therefore, the existing hazardous waste landfills would have sufficient capacity to handle the small amounts of hazardous waste expected to be generated under the Proposed Action.

Installation Restoration Program

Normal operation would not generate impacts on IRP Site 6 (SLC-3W), IRP Site 5 (SLC-3E), or IRP Site 7 (Bear Creek Pond). In addition, operation would not impact ongoing investigations at either site and would not impact ongoing investigations at AOC-66 or AOC-91.

In the event of a launch mishap, IRP sites and AOCs within the vicinity of SLC-3W (IRP Sites 5, 6, and 7) could be affected by debris. However, it should be noted that the probability of a launch mishap occurring is extremely low, and if one occurred, the probability of debris landing at these sites and AOCs is also low. Therefore, impacts on IRP sites and AOCs in the event of a launch mishap would be less than significant.

4.6.1.2 Refurbishment Impacts

Hazardous Materials

All hazardous materials used and waste generated during refurbishment activities associated with the Proposed Action would be handled, transported, treated, and disposed of in accordance with the Hazardous Materials Contingency Plan and Hazardous Waste Management Plan prepared by Space X for the Falcon Launch Vehicle Program. Hazardous materials used for refurbishment activities would include diesel fuel, oil, paint, solvents, and other materials typically used to run and maintain heavy equipment. If an inadvertent release of oil or hazardous materials occurs during refurbishment, the response would follow the Emergency Response Plan developed for the Falcon Launch Vehicle Program. Because all applicable federal, state, county, and Air Force regulations would be followed to store, handle, and dispose of hazardous materials, refurbishment activities would generate less than significant impacts on hazardous materials management.

Hazardous Waste

Prior to 1998, Building 770 contained lead-based paint and asbestos-containing materials (perlite). After Lockheed Martin Corporation decommissioned SLC-3W in 1998, design plans indicate that all asbestos-

containing materials were removed from Building 770. However, Building 770 still contains lead-based paint that was left after Lockheed Martin Corporation decommissioned the building in 1998. Testing for the lead-based paint would be conducted prior to construction to determine the extent of it in the building and to determine proper procedures for removal or cover of the paint and disposal of the paint. All lead-based paint would be mitigated prior to construction. Other than lead-based paint, refurbishment is anticipated to generate very small quantities of hazardous waste associated with use of hazardous materials required to run and maintain heavy construction equipment. Because all applicable federal, state, county, and Air Force regulations would be followed to properly store, handle, and dispose of hazardous waste, including lead-based paint at Building 770, refurbishment activities would generate less than significant impacts on hazardous waste management. In addition, hazardous waste streams anticipated to be generated by the Falcon Launch Vehicle Program are typical of other hazardous waste streams in California. Therefore, the existing hazardous waste landfills would have sufficient capacity to handle the small amounts of hazardous waste expected to be generated under the Proposed Action.

Installation Restoration Program

Minimal ground disturbing activities would occur at SLC-3W within IRP Site 6. Ground disturbance during refurbishment would include re-grading existing dirt roadways and trenching for utilities to maximum depths of 16 feet. Since there is no soil contamination at IRP Site 6 and contaminated groundwater is at depths of 200 feet bgs, ground activities at SLC-3W would not affect contaminated media at IRP Site 6. Therefore, there would be no refurbishment impacts on IRP sites.

4.6.2 Alternative 1

4.6.2.1 Operation Impacts

Under Alternative 1 launch deluge wastewater would not be generated. Therefore, impacts on hazardous materials and hazardous waste management generated by the operation of Alternative 1 would be potentially be less than those generated by the Proposed Action if the deluge wastewater is characterized as hazardous after testing. All other impacts on hazardous materials and hazardous waste management would be identical to the Proposed Action. Therefore, less than significant impacts on hazardous materials or hazardous waste management would occur under operation of Alternative 1.

4.6.2.2 Refurbishment Impacts

Impacts on hazardous materials and hazardous waste management generated during the refurbishment activities of Alternative 1 would be identical to those of the Proposed Action and would, therefore, be less than significant.

4.6.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no impacts on hazardous materials or hazardous waste management would be generated.

4.6.4 Mitigation Measures

Impacts on hazardous materials and hazardous waste management are less than significant, as such, no mitigation measures are recommended.

4.7 WATER RESOURCES

A project may have a significant impact on water resources if it substantially affects any significant water body, such as an ocean, stream, lake, or bay; causes substantial flooding or exposes people to reasonably foreseeable hydrologic hazards such as flooding; substantially affects surface or groundwater quality or quantity; or exceeds the existing potable water or wastewater system capacities for Vandenberg AFB.

4.7.1 Proposed Action

4.7.1.1 Operation Impacts

Surface Water and Jurisdictional Waters of the United States

Under the Proposed Action, launch deluge wastewater generated by both testing and launch operations would be contained in the retention basin and removed and hauled to an approved off-base disposal facility. Therefore, no impacts on surface water quality would occur from industrial wastewater from the deluge water system.

Operation of the Proposed Action has the potential to cause inadvertent discharge of industrial wastewater (deluge water) into jurisdictional waters of the United States in the event of an overflow of the deluge water system retention basin, due to their proximity to the retention basin. However, with the retention basin capacity of approximately 200,000 gallons, it is highly unlikely that the maximum 8,000-gallon discharge of deluge wastewater would be inadvertently discharged from the basin. Therefore, less than significant impacts on jurisdictional waters of the United States are expected under operation of the Proposed Action.

The intermittent drainage at SLC-3W and potentially Bear Creek could be affected by the exhaust cloud that would form near the launch pad at liftoff as a result of the exhaust plume and evaporation and subsequent condensation of deluge water. Because the Falcon launch vehicles use only LOX and RP-1 propellants, the exhaust cloud would consist of steam only and would not consist of any hazardous materials. As the volume of water expected to condense from the exhaust cloud is expected to be minimal, the exhaust cloud would generate less than significant impacts on surface water quality at SLC-3W.

Upon impact with the ocean, approximately 5-gallons of residual RP-1 would be expelled into the ocean and would dissipate within hours. Due to the small volume of this release into the open ocean, impacts on water quality in the ocean would be less than significant.

Groundwater

Operation of the Proposed Action would not affect groundwater because groundwater is located at 200 feet below ground surface, therefore, no impacts on this resource would occur.

Water Supply

Under the Proposed Action, a launch deluge water system would be installed that would deliver 2,000 gallons per minute of potable water for 2 to 3 minutes during each launch, for fire and noise suppression. This system may require testing prior to launch, which will consist of operating the system for 1 to 2 minutes, generating approximately 4,000 gallons. Assuming that the potable water use would occur for a maximum of 33 minutes (including both testing and launch operation) for a maximum of 2 to 3 launches

per year, a maximum of 20,000 to 30,000 gallons of potable water per year would be required. A minor amount of additional potable water would be required to support the personnel and facilities at SLC-3W. The total increase in potable water use per year required for the Proposed Action is minimal, and would not noticeably affect the quantity of water available to Vandenberg AFB or the surrounding area. Therefore, impacts on the water supply at Vandenberg AFB and elsewhere would be less than significant.

Domestic Wastewater Management

The design flow rate specification of 4,500 gallons per day for the recently installed SLC-3 septic system was based upon flow measurements collected in July 2000. Since SLC-3W was inactive at that time, there may not be remaining capacity to accommodate an additional estimated 825 gallons of domestic wastewater per day (based on 33-gallon per person rate for 25 personnel present for launch events). The septic system will be evaluated to determine if the system has sufficient capacity to be connected to Building 770. If it is found to not have sufficient capacity, Space X would use an aboveground septic tank and employ a contractor to pump and haul domestic wastewater off-base for proper disposal. Therefore, the Proposed Action would have less than significant impacts on domestic wastewater.

Industrial or Hazardous Wastewater Management

Under the Proposed Action, launch deluge wastewater generated by both testing and launch operations would be contained in the retention basin, characterized as either hazardous or non-hazardous, and removed and hauled to an approved off-base disposal facility. Because only LOX and RP-1 are used as propellants it is anticipated that the launch deluge wastewater would be non-hazardous. The volume of deluge wastewater generated from both test and launch activities (approximately 8,000 gallons per launch after evaporation), however, would be well within the capacity of existing facilities for treatment and disposal, whether hazardous or non-hazardous. Therefore, there would be less than significant impacts on these facilities.

4.7.1.2 Refurbishment Impacts

Surface Water and Jurisdictional Waters of the United States

The proposed project would disturb approximately 1.4 acres of land. Since the federal regulations require that by 10 March 2003, all small construction sites (between 1 and 5 acres) must obtain permit coverage for their storm water discharges, Space X would file under the existing General NPDES Permit for Storm Water Discharges Associated with Construction Activities although it has not yet been updated. This permit requires submittal of an NOI and the preparation of a SWPPP and the use of standard best management practices to reduce potential impacts on surface waters, including jurisdictional waters of the United States, on the project site. Space X would also be subject to any additional Phase II storm water best management practices. Compliance with permit requirements and regulations and implementation of best management practices described in Section 2.1.2.3, *Best Management Practices* would, therefore, ensure refurbishment impacts on surface water would remain at less than significant levels. Avoidance of the jurisdictional waters of the United States during refurbishment activities would also avoid impacts on these resources. Because fill or dredging of the jurisdictional waters of the United States would not occur, a Section 404 permit or Section 401 Water Quality Certification would not be necessary for the proposed project.

Groundwater

Refurbishment activities of the Proposed Action would not affect groundwater because groundwater is located at 200 feet bgs; therefore, no impacts on this resource would occur.

Water Supply

Refurbishment activities of the Proposed Action would not affect water supply; therefore, no impacts on this resource would occur.

Domestic Wastewater Management

Refurbishment activities of the Proposed Action would not affect domestic wastewater management; therefore, no impacts on this resource would occur.

Industrial or Hazardous Wastewater Management

Design and construction of the launch deluge water system would follow the requirements of EWR 127-1, Chapter 5, Facilities and Structures Documentation, Design, Construction, Test, and Inspection Requirements. Because refurbishment of this system would comply with Air Force regulations and because refurbishment activities of the Proposed Action would not directly affect industrial or hazardous wastewater management; no impacts on this resource would occur.

4.7.2 Alternative 1

4.7.2.1 Operation Impacts

Under Alternative 1, a deluge water system would not be used, eliminating potential operational impacts on surface water quality or jurisdictional waters of the United States. Alternative 1 would also have less impact on water supply. Alternative 1 impacts on domestic wastewater management would be identical to the Proposed Action. Therefore, impacts on water resources would be less under Alternative 1 than the Proposed Action, and would remain less than significant.

4.7.2.2 Refurbishment Impacts

Impacts on water resources generated during the refurbishment activities of Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.7.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented, therefore, no operational or refurbishment impacts on water resources would occur.

4.7.4 Mitigation Measures

Impacts on water resources would be less than significant, therefore, no mitigation measures are recommended.

4.8 GEOLOGY AND SOILS

A project may result in a significant geologic impact if it increases the likelihood of, or results in exposure to, earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. It may also be considered a significant geologic impact if it results in the loss of the use of soil for agriculture or habitat, loss of aesthetic value from a unique landform, loss of mineral resources, or causes severe erosion or sedimentation.

4.8.1 Proposed Action

4.8.1.1 Operation Impacts

Operation of the Proposed Action would not affect geology or soils at or near SLC-3W. Therefore, no impacts on these resources would occur under operation of the Proposed Action.

4.8.1.2 Refurbishment Impacts

Geologic Impacts

No unique geologic features of exceptional interest or mineral resources occur in the project area; therefore, no impacts would occur to these resources.

Space Launch Complex 3W is in Seismic Hazard Zone 4, the most severe seismic region. Although no faults cross SLC-3W and the nearest major fault is 2.5 miles south of SLC-3W, the site is an area likely to sustain major damage from earthquakes corresponding to intensities of 7 or higher on the Modified Mercalli Scale. Seismic design of the SLC-3W facilities would follow seismic requirements contained in EWR 127-1, Section 3.17 and Section 5.6; Chapter 13, Sections A and B of Air Force Manual 88-3; and current industry standards. Therefore, because refurbishment of the SLC-3W facilities would follow Air Force and industry standards for seismic design, the facilities are anticipated to withstand strong ground motion typical of earthquakes of magnitudes of 7 or greater on the Modified Mercalli Scale. Therefore, the Proposed Action would not increase the likelihood of earthquake damage.

Impacts on Topography and Soil

Because of the generally even topography and types of geologic materials and soils present at SLC-3W, the probability of landslides and land subsidence in the general project area is low. Review of available geologic maps (Versar, Inc. 1991) indicates that no landslides have been mapped in the project area. In addition, no apparent landslides were observed during a reconnaissance of the project site. Therefore, the Proposed Action would not generate landslides, land subsidence, or any other severe geologic hazards.

Trenching and grading required for reinstallation of utilities and paving of roads has the potential to increase wind and water erosion at SLC-3W despite the even topography and the moderate erosion potential of soils present at SLC-3W. Implementation of standard best management practices for stockpiling soils on-site and other erosion control measures, however, would ensure that refurbishment activity impacts on erosion remain at less than significant levels.

4.8.2 Alternative 1

4.8.2.1 Operation Impacts

Impacts on geology and soils generated during the operation of Alternative 1 would be identical to those generated by operation of the Proposed Action; therefore, no impacts would occur.

4.8.2.2 Refurbishment Impacts

Impacts on geology and soils generated during the refurbishment activities of Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.8.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no operational or refurbishment impacts on geology and soils would occur.

4.8.4 Mitigation Measures

Impacts on geology and soils are less than significant, as such, no mitigation measures are recommended.

4.9 TRANSPORTATION

The following section discusses the projected traffic conditions along roadways affected during the refurbishment and operation of the Falcon Launch Vehicle Program. Operation and refurbishment impacts on transportation due to the commute of refurbishment workers and Space X personnel, shipment of Falcon components, delivery truck trips to and from SLC-3W, and railroad overflights, are discussed below. A project would have a significant impact on transportation if it caused an exceedance of the capacity of roadways or impact structural sections of roadways.

4.9.1 Proposed Action

4.9.1.1 Operation Impacts

Assembly of the first and second stages of the Falcon would occur at the Space X facility in El Segundo, California. Following assembly, the stages would be transported along major highways (Interstate 5, Interstate 405, and Highway 101) and roads to Vandenberg AFB. Payloads would be shipped via major arterials depending upon their origin. Shipment of these components to Vandenberg AFB would occur no more than six times a year; therefore, they would have a less than significant impact on traffic in the region. Hazardous materials and hazardous wastes transferred by the Falcon Launch Vehicle Program are in the same categories as those normally encountered in public transportation; their shipment over public highways and roads would be in compliance with Department of Transportation regulations and the California Vehicle Code.

During routine operations between launches, a maximum of three Space X personnel would be stationed at SLC-3W. During a launch campaign, 10 to 12 people on average would be stationed at SLC-3W for a period of 4 to 8 weeks, with a maximum of 25 people for a 1-week period within this timeframe. In addition, ten trucks would visit SLC-3W approximately once a week, including a fuel truck, LOX truck, nitrogen truck, helium truck, a truck to deliver a crane, three delivery trucks, a pump truck for deluge wastewater disposal, and a pump truck for domestic wastewater disposal, during a launch campaign (for a

total of 80 daily vehicle trips per launch). Assuming the worst-case scenario, the addition of 25 personnel (or 25 daily vehicle trips) and ten delivery trucks (or 80 daily vehicle trips) traveling on key roadways within Lompoc and Vandenberg AFB would not constitute a significant increase in the traffic volumes on these roadways (a total addition of 105 daily vehicle trips during a launch). Therefore, operation of the Proposed Action would generate less than significant impacts on transportation.

The main line of the Southern Pacific Railroad passes through the launch pad safety corridor at Vandenberg AFB. An average of four passenger and eight freight trains pass through Vandenberg AFB each day. Because Vandenberg AFB launches are coordinated with the railroad, less than significant impacts on railroads would be generated by the Proposed Action.

4.9.1.2 Refurbishment Impacts

During the Proposed Action refurbishment activities, 5 people on average would be at SLC-3W for a period of 3 to 5 months. A maximum of 15 people may be on-site at any one time during this timeframe. Assuming the worst-case scenario, an addition of 15 people (or 15 daily vehicle trips) traveling on key roadways within Lompoc and Vandenberg AFB would not constitute a significant increase in the traffic volumes on these roadways.

Although 15 types of heavy vehicles may be required to construct the Proposed Action, the majority of these vehicles would only travel to and from the site once. Therefore, the one-time transport of these vehicles to SLC-3W would generate less than significant impacts on transportation.

4.9.2 Alternative 1

4.9.2.1 Operation Impacts

Impacts on transportation generated during the operation of Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.9.2.2 Refurbishment Impacts

Impacts on transportation generated during the refurbishment activities of Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.9.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no operational or refurbishment impacts on transportation would occur.

4.9.4 Mitigation Measures

Because less than significant impacts on transportation would occur, no mitigation measures are recommended.

4.10 UTILITIES

A project may have significant effects on a public utility if it increases demand in excess of utility system capacity to the point that substantial expansion becomes necessary. Significant environmental impacts

could also result from system deterioration due to improper maintenance or extension of service beyond its useful life.

4.10.1 Proposed Action

4.10.1.1 Operation Impacts

Operation of the EELV Program was anticipated to use approximately 233 kilowatt-hours of electricity at SLC-3W (U.S. Air Force 1998a). Operation of the Proposed Action is expected to use less electricity than the EELV Program. The relative increase in electricity use compared with the 452 megawatt-hours used on Vandenberg AFB (U.S. Air Force 1998a) would generate minimal increases in electrical consumption as a result of implementing the Falcon Launch Vehicle Program. This increase would not impact the Vandenberg AFB electrical distribution system and no measurable changes in electrical consumption off-base would result. Therefore, the Proposed Action would generate no significant impacts on electrical distribution systems.

Operation of the Falcon Launch Vehicle Program would use existing communication lines at and near SLC-3W and would not require expansion of the existing fiber optic system. Therefore, operation of the Proposed Action would have no significant impacts on this utility.

4.10.1.2 Refurbishment Impacts

Refurbishment of the Proposed Action would generate minimal increases in electrical consumption. This increase would not impact the Vandenberg AFB electrical distribution system and no measurable changes in electrical consumption off-base would result. Therefore, refurbishment activities of the Proposed Action would generate no significant impacts on electrical distribution systems.

Refurbishment of the Proposed Action would not affect communication systems at Vandenberg AFB. Therefore, no impacts would occur to this utility.

4.10.2 Alternative 1

4.10.2.1 Operation Impacts

Impacts on utilities generated by the operation of Alternative 1 would be identical to those of the Proposed Action, and therefore, no impacts would occur to utilities.

4.10.2.2 Refurbishment Impacts

Impacts on utilities generated by refurbishment activities for Alternative 1 would be identical to those of the Proposed Action and therefore, no impacts would occur to utilities.

4.10.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no operational or refurbishment impacts on utilities would occur.

4.10.4 Mitigation Measures

Because no significant impacts on utilities would occur, no mitigation measures are recommended.

4.11 SOLID WASTE

Impacts on solid waste would be considered significant if they resulted in noncompliance with applicable regulatory guidelines or increased the amounts generated beyond available waste management capacities.

4.11.1 Proposed Action

4.11.1.1 Operation Impacts

Operation of the EELV Program was anticipated to generate approximately 0.3 ton of solid waste per day (U.S. Air Force 1998a). Operation of the Proposed Action is expected to generate less solid waste than the EELV Program. Space X would contract or perform in-house removal of solid waste to an off-base recycling or disposal facility. The amount of solid waste generated would be minimal, and largely consist of administrative and personal material such as paper, cans and bottles that would be recycled. Therefore, operation of the Proposed Action is anticipated to generate minimal amounts of solid waste compared with the capacity of the Lompoc or Tajiguas Landfills. The Proposed Action, therefore, would generate less than significant impacts on solid waste.

4.11.1.2 Refurbishment Impacts

Solid waste, including small amounts of concrete and scrap metal, would be generated during refurbishment. When feasible, solid waste would be recycled; if not recyclable, it would be disposed of in existing off-base sanitary landfills permitted to accept the waste (Lompoc or Tajiguas Landfills). Refurbishment of the Proposed Action is anticipated to generate minimal amounts of solid waste compared with the capacity of the Lompoc or Tajiguas Landfills. The Proposed Action would, therefore, generate less than significant impacts on solid waste.

4.11.2 Alternative 1

4.11.2.1 Operation Impacts

Solid waste impacts generated by the operation of Alternative 1 would be identical to those of the operation of the Proposed Action, and would therefore be less than significant.

4.11.2.2 Refurbishment Impacts

Solid waste impacts generated by refurbishment activities for Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.11.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Vehicle Program would not be implemented; therefore, no operational or refurbishment impacts on solid waste management would occur.

4.11.4 Mitigation Measures

Because less than significant impacts on solid waste would occur, no mitigation measures are recommended.

4.12 HEALTH AND SAFETY

An impact would be considered significant if it created a potential public health hazard, or involved the use, production, or disposal of materials that pose a hazard to people, animals, or plant populations in the affected area.

4.12.1 Proposed Action

4.12.1.1 Operation Impacts

Operation of the Falcon Launch Vehicle Program at Vandenberg AFB would have the potential to present an undue hazard to persons and property due to potential dispersion of hazardous materials, propagation of blast, or mishap at the launch pad or during flight. However, Space X would adhere to all established Vandenberg AFB safety requirements and procedures for the areas affected by the Falcon Launch Vehicles Program operations, including requirements and procedures for range safety, fire protection, mission/vehicle reliability, quantity distance criteria, hazardous materials transportation safety, toxic release contingency, exposure criteria, and security (as discussed in Section 3.12, Health and Safety). Current plans under the Falcon Launch Vehicle Program would comply with all of these requirements and the Falcon Launch Vehicle Program is currently undergoing a thorough safety review. Therefore, health and safety impacts generated under operation of the Falcon Launch Vehicle Program should be less than significant.

4.12.1.2 Refurbishment Impacts

During refurbishment of the Proposed Alternative, Space X would comply with all federal OSHA regulations and all applicable Air Force Instructions and regulations on refurbishment safety, including AFI 32-1023, *Design and Refurbishment Standards and Execution of Facility Refurbishment Projects*, EWR 127-1, Chapter 5, Facilities and Structures Documentation, Design, Construction, Test, and Inspection Requirements, and Air Force Occupational Safety and Health Standards. In addition, refurbishment of the SLC-3W facilities would follow Air Force standards for seismic design, so that the facilities are anticipated to withstand strong ground motion typical of earthquakes of magnitudes of 7 or greater on the Modified Mercalli Scale. Health and safety impacts generated during refurbishment would, therefore, be less than significant.

4.12.2 Alternative 1

4.12.2.1 Operation Impacts

Because a deluge water system would not be utilized under Alternative 1, there would be a higher potential for an outbreak of fire beyond the launch pad and greater rocket noise impacts at the launch pad (see Section 4.2, Noise). However, design and operation of the launch system at SLC-3W would still remain compliant with Vandenberg AFB health and safety requirements even without a deluge water system; therefore, health and safety impacts generated by operation of Alternative 1 would still be less than significant.

4.12.2.2 Refurbishment Impacts

Health and safety impacts generated by refurbishment activities for Alternative 1 would be identical to those of the Proposed Action, and would therefore be less than significant.

4.12.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no health and safety impacts would be generated.

4.12.4 Mitigation Measures

Because there would be no significant impacts on health and safety, no mitigation measures are required.

4.13 SOCIOECONOMICS

Socioeconomic impacts would be considered significant if they substantially altered the location and distribution of the local population, caused the population to exceed historic growth rates, decreased jobs so as to substantially raise the regional unemployment rates or reduce income generation, substantially affected the local housing market and vacancy rates, or resulted in the need for new social services and support facilities.

4.13.1 Proposed Action

4.13.1.1 Operation Impacts

During non-launch periods, operation of the Proposed Action would support 3 people at SLC-3W. During launch periods, operation of the Proposed Action would support an average of 10 to 12 people for 4 to 8 weeks, with a peak of 25 people occurring for a 1-week window during that timeframe. The addition of a maximum of 25 workers at Vandenberg AFB does not represent a significant increase in the population or growth rate of the region. The Proposed Action would not significantly affect the local housing market, and the addition of a maximum of 25 people would not result in the need for new social services or support facilities. Therefore, the Proposed Action would generate no socioeconomic impacts on the region.

4.13.1.2 Refurbishment Impacts

Refurbishment activities for the Proposed Action would result in a temporary and minor increase in the number of on-base personnel. This increase would not represent a significant increase in the population or growth rate of the region. The local housing market would not be substantially affected, and no new social services or support facilities would be required. The Proposed Action may actually result in a minor increase in the employment of the region, thus generating positive impacts. Therefore, refurbishment activities of the Proposed Action would generate no significant socioeconomic impacts on the region.

4.13.2 Alternative 1

4.13.2.1 Operation Impacts

Socioeconomic impacts generated by operation of Alternative 1 would be identical to those of the Proposed Action, and would therefore not be considered significant.

4.13.2.2 Refurbishment Impacts

Socioeconomic impacts generated by refurbishment activities for Alternative 1 would be identical to those of the Proposed Action. Therefore, Alternative 1 would not generate any significant adverse impacts on the socioeconomics of the region, and minor positive impacts may actually be generated.

4.13.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no operational or refurbishment impacts on socioeconomics would occur.

4.13.4 Mitigation Measures

Because no significant impacts on the socioeconomics of the region would occur, no mitigation measures are recommended.

4.14 ENVIRONMENTAL JUSTICE

A significant impact to environmental justice would occur if:

- There was a significant adverse impact to the natural or physical environment or to health that affected a minority or low-income population or children;
- There was a significant adverse environmental impact on minority or low-income populations or children that appreciably exceeded those on the general population or other comparison group;
- The risk or rate of environmental hazard exposure by a minority or low-income population was significant and exceeded those by the general population or other comparison group; or
- A health or environmental effect occurred in a minority or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

4.14.1 Proposed Action

There are no minority or low income groups that are in proximity to SLC-3W. Environmental impacts generated by operation and refurbishment activities for the Proposed Action would be less than significant and would not appreciably affect minority or low-income populations or children. Therefore, operation and refurbishment of the Proposed Action would not cause any environmental justice impacts.

4.14.2 Alternative 1

Environmental justice impacts generated by Alternative 1 would be identical to those generated by the Proposed Action. Therefore, no impacts would be generated.

4.14.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented, therefore, no environmental justice impacts would be generated.

4.14.4 Mitigation Measures

Because no impacts on environmental justice would occur, no mitigation measures are recommended.

4.15 CUMULATIVE IMPACTS

Cumulative impacts refer to two or more individual impacts that, when considered together, are significant, or compound or increase other environmental impacts. A cumulative impact is a change in the environment that results from the incremental impact of the project when added together, closely related past, present, or reasonably foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

4.15.1 Proposed Action

4.15.1.1 Land Use

Due to beach closures for several launches on Vandenberg AFB, the Proposed Action would generate cumulative impacts on beaches. Cumulative impacts would only be generated at Ocean Beach County Park and Jalama Beach County Park, the two beaches that may be closed during launches and launch attempts. Any beach closures during launches would add to the current yearly average of 5 closures at Jalama Beach County Park and 2 closures at Ocean Beach County Park. Closures due to Falcon launches may also add to current beach closures required during the breeding season for the western snowy plover at Ocean Beach County Park as well. However, since a maximum of 2 to 3 launches of the Falcon per year would occur, any cumulative impacts on beach access would be less than significant.

4.15.1.2 Biological Resources

Due to repeated noise disturbance on wildlife and heat and fire on the launch pad from all launches, cumulative impacts on wildlife may occur. Repeated noise disturbance and heat and fire on the launch pad may generate a range of behavioral responses in wildlife. Eventually, due to repeated disturbance, wildlife may abandon nests, or relocate from the disturbed area. Past studies have shown that some species would not be cumulatively affected by repeated noise disturbances (see Section 4.7, Biological Resources). In addition, because launches under the Falcon Launch Vehicle Program would be (1) of short duration, (2) infrequent over the course of a year with a maximum of 2 to 3 launches per year and at least one month scheduled between launches, and (3) have less than significant project-specific impacts on biological resources, any cumulative impacts on biological resources would be less than significant. Even with adding a maximum of 2 to 3 projected launches under the Falcon Launch Vehicle Program, the total number of launches per year at Vandenberg AFB would be within the 20 launches per year assumed in the Letter of Authorization issued by NOAA Fisheries.

Because no significant impacts on biological resources are anticipated from the exhaust cloud or a launch mishap, no cumulative impacts on biological resources from these aspects of the program would occur.

4.15.1.3 Transportation

In 2004 or 2005, Vandenberg AFB would be conducting two projects which would involve installation of a new water line along Bear Creek Road, starting at SLC-3 and heading east towards Arguello Road. New pipeline would then be installed south along Arguello Road for one project and installed north along Arguello Road towards the South Gate for another project. Both projects would last approximately 1 year or less. During construction, one lane of Arguello Road and/or Bear Creek Road could be closed.

Transportation to and from SLC-3W for the Falcon Launch Vehicle Program would be conducted along Arguello Road and Bear Creek Road during implementation of these projects. However, because one lane would be open at all times, the Falcon Launch Vehicle Program and the water line projects are not anticipated to interfere with one another. Therefore, the Proposed Action would have less than significant cumulative impacts on transportation.

4.15.2 Alternative 1

Under Alternative 1, the deluge water system would not be used and noise levels at the launch site would likely be higher and have a potentially greater impact on biological resources near the launch site. However, noise levels are not expected to have significant impacts on wildlife under Alternative 1 (see Section 4.2, Noise). In addition, increased noise levels at the launch pad would be localized at or adjacent to SLC-3W. Therefore, cumulative impacts on biological resources generated by Alternative 1 would be less than significant. Alternative 1 would have identical cumulative impacts on land use and transportation as the Proposed Action.

4.15.3 No-Action Alternative

Under the No-Action Alternative, the Falcon Launch Vehicle Program would not be implemented; therefore, no cumulative impacts would be generated.

4.15.4 Mitigation Measures

Because cumulative impacts would be less than significant, no mitigation measures are recommended.

5.0 COMPLIANCE WITH APPLICABLE ENVIRONMENTAL REQUIREMENTS

5.0 COMPLIANCE WITH APPLICABLE ENVIRONMENTAL REQUIREMENTS

This section provides a description of the federal, state, local, and Air Force regulations with which Space X must comply prior to and during construction and operation of the proposed project.

5.1 FEDERAL REGULATIONS

Federal Regulations Regarding Environmental Quality

The National Environmental Policy Act (42 U.S.C. 4321–4347 as amended) requires federal agencies to analyze the potential environmental impacts of major federal actions and alternatives and to use these analyses as a decision making tool on whether and how to proceed with the Proposed Action or Alternatives.

Federal Regulations Regarding Biological Resources

Public Law 93-205 requires military installations to protect and conserve federally listed, endangered, and threatened plants and wildlife.

The *Endangered Species Act* of 1973 declares the intention of the Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The Act requires that federal agencies, in consultation with the U.S. Fish and Wildlife Service and NOAA Fisheries, use their authorities in furtherance of its purposes by carrying out programs for the conservation of endangered or threatened species.

Section 7 of the *Endangered Species Act* (16 U.S.C. 1536) contains provisions that require federal agencies to consult with the Secretary of Interior and to take necessary actions to ensure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species and threatened species. Federal agencies must ensure that actions taken will not result in the destruction or modification of the habitat of endangered species.

Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*), Section 101(a)(5)(A) directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and regulations are issued. Permission may be granted for periods of 5 years or less if the NMFS finds that the taking will have a negligible impact on the species or stock(s); will not have an unmitigatable adverse impact on the availability of the species or stock(s) for subsistence uses; and the permissible methods of taking and requirements pertaining to the monitoring and reporting of such taking are set forth.

Federal Regulations Regarding Cultural Resources

Volume 3 of the Vandenberg AFB *Integrated Cultural Resource Management Plan* (Moratto 2002) details the legal authorities regulating cultural resources on the base. These include An Act for the Preservation of Antiquities of 1906 (Public Law 59-209); the Historic Sites Act of 1935 (Public Law 74-292); the Reservoir Salvage Act of 1960 (Public Law 86-523); the National Historic Preservation Act of 1966 (Public Law 89-665), as amended; Executive Order 11593 of 1971 (36 CFR 154); the American Indian Religious Freedom Act of 1978 (Public Law 95-341); the Archaeological Resource Protection Act

of 1979 (Public Law 96-95); the Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601); and the Air Force Instruction for cultural resource management of 1994 (AFI 32-7065).

On a day-to-day basis, cultural resource management on Vandenberg AFB is guided primarily by Section 106 of the *National Historic Preservation Act* and its implementing regulations, 36 CFR 800. Briefly, Section 106 requires federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is on or eligible for the National Register. An undertaking is defined as "a project, activity, or program funded in whole or part under the direct or indirect jurisdiction of a Federal Agency, including those carried out by or on behalf of a Federal Agency; those carried out with Federal financial assistance; those requiring a Federal permit, license, or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency" (36 CFR 800.16[y]). For any undertaking, the Section 106 process requires identification of historic properties (i.e., those on or eligible for the National Register), assessment of potential adverse project effects on any historic properties, and resolution of adverse effects in consultation with the State Historic Preservation Officer and/or, if necessary, the Advisory Council on Historic Preservation.

Other important regulations governing cultural resource management on Vandenberg AFB on a daily basis include the *American Indian Religious Freedom Act*, which states that it shall be the "policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions, . . . including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites" (92 Stat. 469:Sec. 1 [Resolution]). The Archaeological Resource Protection Act was passed in 1979 to protect archaeological resources and sites on public lands, and requires a permit for any excavation or removal of archaeological resources from public lands. The Native American Graves Protection and Repatriation Act and its implementing regulations, 43 CFR 10, provides ownership or control of Native American human remains and selected cultural items excavated or discovered on federal lands with designated Native American tribes, organizations, or groups. If human remains or selected cultural items are discovered on federal lands, the appropriate Native American group must be notified. AFI 32-7065 provides detailed guidance for compliance with relevant extant authorities.

Federal Regulations Regarding Air Quality

The proposed project is federally regulated by the following Titles:

- Title 40 CFR 50: NAAQS;
- Title 40 CFR 51: Requirements for Preparation, Adoption, and Submittal of Implementation Plans;
- Title 40 CFR 61: NESHAP;
- Title 50 CFR 63: NESHAP for Source Categories;
- Title 40 CFR 70: State Operating Permit Program; and
- Title 49 CFR Parts 100-199: Hazardous Materials Regulation.

Each of these regulations is briefly discussed below.

Title 40 CFR 50 (NAAQS): The Clean Air Act required the U.S. EPA to establish ambient ceilings for certain criteria pollutants. Subsequently, the U.S. EPA promulgated regulations that set NAAQS. Two classes of standards were established: primary and secondary. Primary standards prescribe the maximum permissible concentration in the ambient air required to protect public health. Secondary standards specify levels of air quality required to protect public welfare, including materials, soils, vegetation, and wildlife, from any known or anticipated adverse effects. The criteria pollutants for which the NAAQS have been established include carbon monoxide, nitrogen dioxide, ozone, PM_{10}, $PM_{2.5}$, and sulfur dioxide.

California has also established its own air quality standards known as the CAAQS. The California standards include all the pollutant criteria listed under the NAAQS except for $PM_{2.5}$. The CAAQS are generally more stringent than the NAAQS and have incorporated additional standards for sulfate, hydrogen sulfide, vinyl chloride, and visibility-reducing particulate matter.

The U.S. EPA classifies air quality within each Air Quality Control Region with regard to its attainment of federal primary and secondary NAAQS. According to U.S. EPA guidelines, an area with air quality better than the NAAQS for a specific pollutant is designated as in attainment for that pollutant. Any area not meeting ambient air quality standards is classified as nonattainment. When there is a lack of data for the U.S. EPA to define an area, the area is designated as unclassified and treated as an attainment area until proven otherwise. Pollutant concentrations within the Santa Barbara Air Basin atmosphere are assessed relative to the federal and state ambient air quality standards.

Title 40 CFR 51 (Implementation Plan): The Santa Barbara County Air Pollution Control District is required to monitor air pollutant levels to ensure federal and state ambient air quality standards are met. If ambient air quality standards are not met, Santa Barbara County Air Pollution Control District must develop a plan to meet them. If the air quality in Santa Barbara County is better than what is established by government standards, the area is classified as an "attainment" area. If regional air quality contains pollutant levels that are in violation of these standards, the area is classified as a "nonattainment" area.

Title 40 CFR 51 Subpart W (General Conformity): General conformity rule applies to federal actions that are not covered by transportation conformity rule, with several listed exceptions. Other than the listed exemptions and presumptions of conformity, general conformity applies to actions in which projected emissions exceed applicable conformity *de minimis* thresholds. However, if the emissions from a federal action do not equal or exceed *de minimis* thresholds but do represent 10 percent or more of a nonattainment or maintenance area's total emissions of any criteria pollutant, the action is considered "regionally significant" and the requirements of conformity determination apply.

Title 40 CFR 61(NESHAP): The NESHAP regulates stationary sources with a prescribed standard under Title 40 CFR 61. Such stationary sources may be required to obtain an operating permit issued by an authorized Air Pollution Control agency or by U.S. EPA in accordance with Title V of the Clean Air Act. The NESHAP identifies and list a variety of hazardous air pollutants that are regulated.

The only section of NESHAP regulations that may apply to the proposed project is Title 40 CFR 63 Subpart GG for manufacturers of commercial, civil, or military aerospace vehicles or components and that are major sources of hazardous air emissions. Such emissions would result from cleaning operations, surface coating with primers and topcoats, paint removal, and waste storage.

Hazardous wastes that are subject to RCRA requirements would be exempt from the subpart. Those wastes would include specialty coatings, adhesives, primers, and sealant materials at aerospace facilities. Other exemptions would include hazardous air pollutants or VOC contents less than 0.1 percent for carcinogens or 1.0 percent for non-carcinogens and low volume coatings.

Title 40 CFR 70 (State Operating Permit Programs): In accordance with Title V of the Clean Air Act large facilities that are capable of producing large amounts of air pollution are required to obtain an operating permit. Permits are issued by the District. Typical activities that require the Clean Air Act Title V permit include any major source (source that emits more than 100 tons per year of criteria pollutant in a nonattainment area for that pollutant or is otherwise defined in Title I as a major source); affected sources as defined in Title IV; sources subject to Section 111 regarding New Source Performance Standards; sources of air toxics regulated under Section 112 of the Clean Air Act; sources required to have new source or modification permits under Parts C or D of Title I of the Clean Air Act; and any other source such as Hazardous Waste pollutants designated by U.S. EPA regulations.

Part 70 Federal Operating Permits are issued to specific emission sources. Sources requiring permits are determined based on the source's potential to emit certain threshold levels of pollution given their equipment and processes. Facilities requiring Part 70 Federal Operating Permits include sources with the potential to emit the following:

- Regulated air pollutant or HAP amounts equal to or greater than:
  - 100 tons/year of any regulated air pollutant;
  - 10 tons/year of any individual HAP or 25 tons/year of a combination of HAPs; or
  - Lesser quantity thresholds for any HAP established by the U.S. EPA rulemaking.
- Any stationary source defined by the U.S. EPA as major for the District under Title I, Part D (Plans for Nonattainment Areas) of the Clean Air Act and its implementing regulations including:
  - For ozone nonattainment areas, sources with the potential to emit 100 tons per year or more of volatile organic compounds or oxides of nitrogen in areas classified as "marginal" or "moderate," 50 tons per year or more in areas classified as "serious," 25 tons per year or more in areas classified as "severe," and 10 tons per year or more in areas classified as "extreme";
- Acid rain sources included under the provisions of Title IV of the Clean Air Act and its implementing regulations.
- Any source required to have a pre-construction review permit pursuant to the requirements of the New Source Review/Prevention of Significant Deterioration program under Title I, Parts C and D of the Clean Air Act and its implementing regulations;
- Any solid waste incineration unit required to obtain a Part 70 permit pursuant to Section 129(e) of the Clean Air Act and its implementing regulations; and
- Any stationary source in a source category required to obtain a Part 70 permit pursuant to regulations promulgated by the U.S. EPA Administrator.

Companies may decide to make equipment or process changes to avoid the federal Part 70 permitting process. Federal rules application depends on the air quality of a specific area and the threshold levels that are set. Currently the Santa Barbara County is classified as serious nonattainment for the ozone federal standard. However, the County recently attained the federal ozone standard and is requesting

reclassification to federal ozone standard attainment. Reclassification would allow increment in Part 70 threshold levels and a reduction in the number of county sources requiring federal permits.

Title 49 CFR Parts 100–199: Liquid propellant for the Falcon launch vehicle must be shipped and handled in accordance with Title 49 CFR Parts 100–199. The liquid propellants would be shipped directly from the manufacturing location to the launch site.

Federal Regulations Regarding Hazardous Waste/Hazardous Materials

The *CERCLA* of 1980 responds to the immediate cleanup of hazardous waste contamination from accidental spills or from waste disposal sites that may result in long-term environmental damage.

The *RCRA* of 1974 (42 U.S.C. 6901 *et seq.*) was designed to control the handling and disposal of hazardous substances by responsible parties. Hazardous waste, as defined by RCRA, is a "waste that may cause or significantly contribute to serious illness or death, or that poses a substantial threat to human health or the environment when improperly disposed." The treatment, storage, and disposal of solid waste (both hazardous and nonhazardous) is regulated under the *Solid Waste Disposal Act* as amended by RCRA and the Hazardous and Solid Waste Amendments of 1984.

The *SARA* of 1986, Title III: *Emergency Planning and Community Right-to-Know Act* establishes standards for community right-to-know programs and requires the reporting of releases of certain toxic chemicals. Local planning committees, comprising government, news media, industry, environmental, organizations, and medical representatives, receive right-to-know information from facilities. Facilities with Standard Industrial Classification codes between 20 and 39 that manufacture, process, or otherwise use listed toxic chemicals, must report a release of these toxic chemicals to the environment, in greater than reportable quantities, on a Form R.

Under *49 CFR Section 170* are Department of Transportation requirements for the shipment of hazardous materials. This section specifies the proper container type, shipping name, and labeling requirements for the transportation of hazardous materials.

The *Toxic Substances Control Act* of 1976 regulates chemical substances and mixtures that present an unreasonable risk of injury to health, or the environment, and acts with respect to chemical substances and mixtures which are imminent hazards.

Federal Regulations Regarding Water Resources

The *Clean Water Act* (33 U.S.C. 1251 *et seq.*) prohibits the discharge of pollutants from a point source into navigable waters of the United States, except in compliance with a NPDES (40 CFR Part 122) permit. The navigable waters of the United States are considered to encompass any body of water whose use, degradation, or destruction will affect interstate or foreign commerce.

Section 402 of the *Clean Water Act* requires that the U.S. EPA establish regulations for issuing permits for storm water discharges associated with industrial activity. A NPDES permit is required if activities involve the disturbance of 1 to 5 acres of land. A Notice of Intent must be submitted to the RWQCB by Vandenberg AFB and a storm water pollution prevention plan must be developed.

Section 404 establishes a program to regulate the discharge of dredged and fill materials into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure

development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. U.S. EPA and the Corps of Engineers jointly administer the program. In addition, the U.S. Fish and Wildlife Service, NOAA Fisheries, and state resource agencies have important advisory roles.

Federal Regulations Regarding Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations). All federal agencies must develop environmental justice strategies and make environmental justice a part of their mission by identifying and addressing, as appropriate, any disproportionate and adverse human health or environmental effects of their activities on minority or low income populations.

5.2 STATE OF CALIFORNIA REGULATIONS

State Regulations Regarding Coastal Activities

Although federal land is not included in coastal zones, federal activity in, or affecting, a coastal zone must comply with the federal Coastal Zone Management Act of 1972, as amended (Public Law 92-583). Section 106(d)(6) of the Act gives the Coastal Commission authority over activities occurring within the coastal zone. The Coastal Commission subsequently developed the California Coastal Zone Management Program, the key policy component of the program being the California Coastal Act of 1976. One of the state policies on coastal zone conservation and development decisions is to protect marine and land resources including wetlands, rare and endangered habitat areas, environmentally sensitive areas, tidepools, and stream channels.

Prior to undertaking a project in the California coastal zone, a federal agency must submit environmental documentation (a Coastal Consistency Determination or Negative Determination) to the Coastal Commission that includes a discussion of potential impacts to issue areas pertaining to coastal resource planning and management policies. If the proposed project is found to be consistent with the applicable policies, the Coastal Commission will approve the Coastal Consistency Determination, or issue a Negative Determination.

State Regulations Regarding Biological Resources

California Endangered Species Act (Fish and Game Code, 2050 *et seq.*). The Act generally parallels the main provisions of the federal Endangered Species Act and is administered by the California Department of Fish and Game. As stated in Section 2052, it is the policy of the Department to conserve, protect, restore, and enhance any endangered or threatened species and its habitat and it is the intent, consistent with conserving the species, to acquire lands for habitat for these species. Under Section 2053, projects as proposed should not be approved if they jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of the species, if there are feasible alternatives available consistent with conserving the species or its habitat that would prevent jeopardy. In the event that a particular condition makes these alternatives infeasible, individual projects may be approved if appropriate mitigation and enhancement measures are provided.

State Regulations Regarding Air Quality

In addition to the federal requirements mentioned above, the proposed project would be subject to Santa Barbara County Air Pollution Control District rules and regulations. Under these rules and regulations,

all stationary and portable source equipment, painting (for aerospace and industrial) activities, and any solvent wipe and flush operations would need to adhere to Vandenberg AFB policy and, would require an Authority to Construct and Permit to Operate from the District prior to implementing refurbishment or operational activities, unless exempted by District Rule 202. Any portable equipment powered by an internal combustion engine of 20 base horsepower or higher used in the proposed project must also be registered with the California Air Resources Board as part of the California State-wide Portable Equipment Registration Program or have a Permit to Operate prior to operation on Vandenberg AFB.

Any new source introduced under the existing Vandenberg AFB Stationary Source Permit or individual permit would also be subject to Regulation VIII, New Source Review. Again, this process could trigger a requirement to implement best available control technology or emission offsets, air quality impact assessment, pre-construction monitoring, and/or visibility to determine the net effect of the proposed activity.

Finally, operation of the salvage ship to recover the first stage of the Falcon Vehicle would require a permit for the use of this vessel in the California coastal waters when in the South Central Coast Air Basin, South Coast Air Basin, and San Diego Air Basin areas; the number and types of permits and permit requirements would depend on where the salvage ship is utilized.

State Regulations Regarding Hazardous Waste/Hazardous Materials

The *California Hazardous Waste Control Law* imposes obligations on facilities that generate hazardous waste. This state law applies to federal facilities insofar as the law requires permitting, inspections, and monitoring. State waste disposal standards, reporting duties, and submission to state inspections are required of federal facilities.

California Administrative Code, Sections 66001 through 67181 contains California's hazardous materials regulations.

California Code of Regulations Title 22 identifies wastes subject to regulation as hazardous wastes under this division and subject to the notification requirements of Health and Safety Code section 25153.6. It gives the criteria used by the California Department of Toxic Substances Control to identify characteristics of hazardous wastes, identifies characteristics of hazardous waste, and lists particular hazardous wastes. It includes sampling procedures and requires the use of the best available technology.

State Regulations Regarding Water Resources

The Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) deals with chemicals and substances determined by California to cause cancer or reproductive toxicity. The regulation and a list of chemicals/substances involved is published in Division 2 of Title 22 beginning with section 12000 of the CCR. It is also published in Title 26, which contains the regulations on toxic substances.

The Porter Cologne Water Quality Control Act protects all waters of the state for the use and enjoyment of the people of California and declares that the protection of water resources be administered by the regional water quality control boards with statewide coordination managed by the State Water Resources Control Board.

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6.0 REFERENCES

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7.0 PERSONS AND AGENCIES CONTACTED

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Garcia, Gabriel
30th Space Wing/SEY, Vandenberg AFB, California.

Surgett, Mark
Santa Barbara County Fire Department, Hazardous Materials, Santa Barbara, California.

This page intentionally left blank.

8.0 LIST OF PREPARERS

8.0 LIST OF PREPARERS

Bates, Michelle A., Biologist/Environmental Scientist, Tetra Tech, Inc.
B.S., 1997, Biology, Pepperdine University, Malibu
M.S., 2000, Environmental Science and Management, University of California, Santa Barbara
Years of Experience: 5

Bell, Gordon J., Environmental Planner/Principal, Bell + Associates, Inc.
B.A., 1986, Environmental Studies, University of California, Santa Barbara
Minor: Geology
Years of Experience: 21

Eldridge, Jacqueline C., Publications Manager, Tetra Tech, Inc.
B.S., 1971, Biology, Fairleigh Dickinson University, Teaneck, New Jersey
M.S., 1978, Marine Science, Long Island University, Greenvale, New York
M.B.A., 1983, Business Administration, National University, Vista, California
Years of Experience: 26

Ige, Geri K., Graphics Supervisor, Tetra Tech, Inc.
Fine Arts, University of California, Irvine
Years of Experience: 19

Knight, James W., Principal Environmental Scientist, Tetra Tech, Inc.
B.S., 1974, Southwest Texas State University, San Marcos
M.A., 1981, Business Management, Webster University, Saint Louis
Years of Experience: 28

Madler, Kristen A., Environmental Planner, Tetra Tech, Inc.
B.S., 1998, Environmental Administration (concentration in Economics), University of Evansville, Evansville, Indiana
Years of Experience: 2

Randall, Diane, GIS Specialist, Tetra Tech, Inc.
Technical Certificate, Computer Programming, Sawyers College, Ventura, California
Technical Certificate, Program Management, Moorpark College, California
Years of Experience: 12

Velazquez, Victor, Associate Engineer, Tetra Tech, Inc.
B.S., 1995, Chemical Engineering, University of California, Santa Barbara
Years of Experience: 5

Warren, Shirley, Word Processor III, Tetra Tech, Inc.
B.A., 1992, Environmental Studies, CSU Sacramento, California
Minor: Geology
Years of Experience: 9

Wellhausen, Nancy, Air Quality Specialist, Tetra Tech, Inc.
Chemical Engineering, University of California, Santa Barbara
Years of Experience: 11

Wilson, Michelle, Environmental Scientist, Tetra Tech, Inc.

B.A., 1993, Environmental Science (concentration in Biology), University of California, Berkeley

Minor: Resource Management

Years of Experience: 11

9.0 ACRONYMS AND ABBREVIATIONS

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AFB	Air Force Base
AFI	Air Force Instruction
AFM	Air Force Manual
ALTRV	Altitude Reservation
AOC	Area of Concern
APE	area of potential effect
AST	aboveground storage tank
CAAQS	California Ambient Air Quality Standards
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CCRWQCB	Central Coast Regional Water Quality Control Board
CDNL	C-weighted day-night level
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CNEL	community noise level equivalent
dB	decibels
dBA	decibels (A-weighted sound levels)
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EA	Environmental Assessment
EELV	Evolved Expendable Launch Vehicles
ES	Engineering Science, Inc.
ESA	Endangered Species Act
EWR	Eastern and Western Range
FAA	Federal Aviation Administration
Falcon	Falcon Launch Vehicle
FONSI	Finding of No Significant Impact
FTS	Flight Termination System
GIS	Geographic Information System
GPS	global positioning system
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HQ AFSPC/SG	Headquarters Air Force Space Command, Surgeon's Office
IRP	Installation Restoration Program
kV	kilovolt
L_{DN}	day/night average sound level

L_{eq}	long-term equivalent A-weighted sound level
LOX	liquid oxygen
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NESHAP	National Emission Stnadard for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
PM_{10}	particulate matter 10 microns or less in diameter
PPA	Pollution Prevention Act
psf	pounds per square foot
RCRA	Resource Conservation and Recovery Act
RP-1	kerosene
SARA	Superfund Amendments and Reauthorization Act
SEL	Sound Exposure Level
SLC	Space Launch Complex
Space X	Space Exploration Technologies Corporation
SPL	sound pressure level
SR	State Route
SWI	Space Wing Instruction
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TCE	trichloroethylene
U.S.C	U.S. Code
U.S. EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WDR	Waste Discharge Requirement

A LETTER OF COOPERATION BETWEEN AIR FORCE AND FAA

U.S. Department of Transportation
Federal Aviation Administration

Commercial Space Transportation

800 Independence Ave., S.W, Room 331
Washington, D.C. 20591

MAR 24 2003

Robert Novak
HQ AFSPC/CEV
150 Vandenberg Street
Peterson Air Force Base, CO 80914-4150

Dear Mr. Novak:

We have received your request that the Federal Aviation Administration, Office of the Associate Administrator for Commercial Space Transportation participate as a cooperating agency in the preparation of the Environmental Assessment for the Falcon Launch Vehicles Program at Vandenberg Air Force Base. We are pleased to grant your request to serve as a cooperating agency and look forward to providing relevant expertise and information to facilitate your National Environmental Policy Act process.

Please feel free to contact me at (202) 267-7793 or Michon Washington, Senior Environmental Specialist, from my staff at (202) 267-9305.

Sincerely,

Herbert Bachner

Herbert Bachner
Manager, Space Systems Development Division

B MAILING LIST

APPENDIX B
MAILING LIST

AFSPC/CEV
150 Vandenberg Street, Suite 1105
Peterson AFB CO 80914-4150

Federal Aviation Administration (FAA)
FAA Environmental
800 Independence Avenue, SW #331
Washington, DC 20591

US Fish & Wildlife Service
Ventura Field Office
2493 Portola Road, Suite B
Ventura CA 93003

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach CA 90802-4213

United States Department of Commerce
National Oceanic and Atmospheric Administration
Channel Islands National Marine Sanctuary
Attn: Chris Mobley
113 Harbor Way, Suite 150
Santa Barbara, CA 93109-2315

National Park Service
Channel Islands National Park
1901 Spinnaker Drive
Ventura, CA 93001

United States Coast Guard
111 Harbor Way
Santa Barbara, CA 93109

California Coastal Commission
Federal Consistency Review
45 Fremont Street, Suite 2000
San Francisco CA 94105-2219

California Regional Water Quality Control Board
Central Coast Region
81 Higuera Street, Suite 200
San Luis Obispo CA 93401-5414

Office of Historic Preservation
State Historic Preservation Officer
PO Box 942896
Sacramento CA 94296-0001

Office of the Governor
Office of Planning and Research
State Clearinghouse
1400 10th Street, Room 121
Sacramento CA 95814

Air Pollution Control District
Attn: Project Review
26 Castilian Drive, Suite B-23
Goleta CA 93117

Santa Barbara County Board of Supervisors
105 East Anapamu Street
Santa Barbara CA 93101

Santa Barbara County Planning & Development
Attn: Project Review
123 East Anapamu Street
Santa Barbara CA 93101-2058

City of Lompoc
Planning Department
100 Civic Center Plaza
Lompoc CA 93438-8001

University of California,
Santa Barbara Library
Government Publications Department
Santa Barbara CA 93106-9010

University of California, Santa Barbara
Dept of Ecology, Evolution
and Marine Biology
Santa Barbara CA 93106-4610

Santa Barbara Museum of Natural History
2559 Puesta Del Sol Road
Santa Barbara CA 93105

Santa Ynez Chumash Indian Reservation
Tribal Elders Council
P.O. Box 365
Santa Ynez CA 93460

Lompoc Public Library
601 East North Avenue
Lompoc CA 93436-3406

Sierra Club
Box 333
Lompoc CA 93436

California Native Plant Society
1530 Bayview Heights Drive
Los Osos CA 93402

Urban Creeks Council
PO Box 1083
Carpinteria CA 93014

La Purisima Audubon Society
PO Box 2045
Lompoc CA 93438

Environmental Defense Center
906 Garden Street, Suite 2
Santa Barbara CA 93101

Santa Barbara Public Library
40 East Anapamu Street
Santa Barbara CA 93101-2000

Santa Maria Public Library
420 South Broadway
Santa Maria CA 93454-5199

C AIR QUALITY ANALYSIS

APPENDIX C
AIR QUALITY ANALYSIS

1.0 CONFORMITY DETERMINATION

1.1 EMISSION THRESHOLDS AND QUANTIFICATION

The emission threshold for determining conformity is based on the National Ambient Air Quality Standards (NAAQS) attainment standard for Santa Barbara County. The current NAAQS classification for Santa Barbara County is in attainment for ozone, particulate matter 10 microns or less in diameter (PM_{10}), oxides of sulfur, carbon monoxide, and lead.

Prior to 16 June 2003, the County was in serious nonattainment of the federal ozone standard; the County is still in moderate nonattainment of the state ozone standard. Although the County is now officially in attainment for the federal standard, for the purposes of this EA, a worst-case conformity analysis is performed assuming that the County is still in nonattainment. The attainment status and corresponding threshold of 50 tons per year for ozone precursors (nitrogen oxides and reactive organic compounds) will be used to determine general conformity.

Emission quantification is defined as the sum of all direct and indirect criteria pollutants and precursor emissions, including stationary and mobile emission sources. Direct and indirect emissions are distinguished by timing and location rather than the type of emission source. Direct emissions occur at the same time and place as the federal action. Indirect emissions include those that may occur later or at a distance from the federal action. General conformity limits the scope of indirect emissions to those that can be quantified and are reasonably foreseeable by the federal agency at the time of analysis, and those which the federal agency can practicably control and maintain control of through its continuing program responsibility.

1.2 EVALUATING CONFORMITY AND REPORTING REQUIREMENTS

The general conformity rule applies to federal actions that are not covered by the transportation conformity rule, with several listed exceptions. Other than the listed exemptions and presumptions of conformity, general conformity applies to actions in which projected emissions exceed applicable conformity *de minimis* thresholds. However, if the emissions from a federal action do not equal or exceed *de minimis* thresholds but do represent 10 percent or more of a nonattainment or maintenance area's total emissions of any criteria pollutant, the action is considered "regionally significant" and the requirements of conformity determination apply.

The reporting requirements for the conformity analysis are not required if the proposed project's direct and indirect emissions are less than the established *de minimis* thresholds and are not considered regionally significant.

1.3 AIR QUALITY JURISDICTION AND ATTAINMENT STATUS

The proposed project would take place in the south section of Vandenberg Air Force Base (AFB) in Santa Barbara County, California. The proposed project is subject to Santa Barbara County Air Pollution Control District (District) rules, regulations, and jurisdiction. U.S. EPA threshold limits used to determine general conformity are listed in Table C-1.

Table C-1
U.S. EPA Threshold Limits Used to Determine General Conformity

Criteria Pollutant	Attainment Status	Threshold Level (tons per year)
Ozone (VOC or NO_x)	Serious	50
	Severe	25
	Extreme	10
	Other ozone nonattainment areas outside of ozone transport region	100
VOC	Marginal/moderate nonattainment within ozone transport region	50
NO_x	Marginal/moderate nonattainment within ozone transport region	100
CO	All nonattainment areas	100
PM_{10}	Moderate	100
	Serious	70
SO_2 or NO_2	All nonattainment areas	100
Pb	All nonattainment areas	25

Source: 40 CFR 93.135 (b)

1.4 DISTRICT EMISSIONS SUMMARY

The District 1996 Emission Inventory, as listed in the 1998 Corrective Action Plan, was compared with the total emissions generated from the worst-case scenario of the proposed project (see Section 4.5, Air Quality for a definition of the "worst-case scenario"). This comparison was performed to determine whether the federal action is "regionally significant." The District 1996 Annual Emission Inventory and Continental Shelf emissions are summarized in Table C-2.

Table C-2
1996 Annual Emission Inventory

Source	NO_x	VOC
Stationary Source Area and Point Sources (tons per year)	2,652.71	6,258.07
Mobile Sources (tons per year)	12,877.86	8,907.12
Outer Continental Shelf Stationary and Mobile Sources (tons per year)	8,458.00	1,535.00
Total	**23,988.57**	**16,700.19**

Source: SBCAPCD 1998 Clean Air Plan.

Outer Continental Shelf (OCS) sources are part of District jurisdiction and the county emission inventory; therefore, OCS emission sources were included in the total emissions when determining whether a federal action is regionally significant.

Tables C-3 and C-4 present a summary of operation and construction reasonably foreseeable mobile and stationary source emissions for the worst-case scenario of the proposed project and a comparison against state and federal thresholds. The emissions presented in this table represent the ozone precursor emissions generated in the lower atmosphere (3,000 feet in altitude) and do not include the carbon monoxide emissions from the launch vehicle. The emissions from the launch vehicle are considered a mobile source, however, the carbon monoxide emissions generated in the lower atmosphere are negligible and are not expected to create a significant source of CO.

Table C-3
Comparison of Annual Construction and Operation Emissions
From Worst Case-Scenario of the Proposed Project to the *de minimis* Threshold

Pollutant		*de minimis* Threshold	Emissions (tons per year) 2003[a,b]	2004[b]	2005[b]	2006[b]
VOCs						
	Construction	50	0.44	0.00	0.00	0.00
	Operation	50	0.21	0.21	0.21	0.21
	Total Emissions		**0.65**	**0.21**	**0.21**	**0.21**
NO_x						
	Construction	50	3.02	0	0	0
	Operation	50	0.34	0.34	0.34	0.34
	Total Emissions		**3.36**	**0.34**	**0.34**	**0.34**

Notes: a. Emissions also include construction emissions, which would be completed in 2003.
b. Operation emissions are evaluated based on the worst-case scenario of six Falcon launches per year.

1.5 WORST-CASE SCENARIO EMISSIONS AND TECHNICAL ASSUMPTIONS

1.5.1 Launch Operation

1.5.1.1 Vehicle Preparation and Transport

Quantifiable emissions resulting from vehicle preparation and transport to SLC-3W would be generated from mobile sources only (no point source or stationary sources were assumed), from the transport of the first and second stages and payload from the Santa Barbara County line, California, to SLC-3W at Vandenberg AFB. The following assumptions were made to estimate these emissions:

- One truck would be used to transport first stage components: 12 trips a year (for a maximum of six launches per year) at 100 miles each trip;
- One truck would be used to transport second stage components: 12 trips a year at 100 miles each trip;

Table C-4
Comparison of Annual Construction and Operation Emissions From Worst Case-Scenario of the Proposed Project to the District 1996 Emission Inventory

Pollutant			Emissions (tons per year) 2003[a,b]	2004	2005	2006
VOCs						
	DISTRICT 1996 Emission Inventory (tons per year)	16,700.19				
	Worst-case total emissions		0.65	0.21	0.21	0.21
	Percentage of emission inventory (%)		<1.00	<1.00	<1.00	<1.00
	Regional significant conformity threshold (%)	10				
	Regional significance		None	None	None	None
Nitrogen Oxides						
	DISTRICT 1996 Emission Inventory (tons per year	23,988.57				
	Worst-case scenario		3.36	0.34	0.34	0.34
	Percentage of emission inventory (%)		<1.00	<1.00	<1.00	<1.00
	Regional significant conformity threshold (%)	10				
	Regional significance		None	None	None	None

Notes: a Construction activities would be completed in 2003.
b Operation emissions are evaluated based on the worst-case scenario of six Falcon launches per year.

- One truck would be used to transport the payload: 12 trips per year at 100 miles each trip;
- One truck would be used to transport helium: 12 trips per year at 100 miles each trip;
- One truck would be used to transport nitrogen: 12 trips per year at 100 miles each trip; and
- One truck would be used to transport a crane to support the launch vehicle assembly at the SLC-3W: 6 trips per year at 40 miles each trip;

Emission factor sources recommended by the South Coast Air Quality Management District (SCAQMD) *California Environmental Quality Act (CEQA) Guidance Document* (2003) were used to calculate mobile

source construction and operation emissions (see Section 1.5.2, Construction Emissions). The CEQA guidance document was used because it is the equivalent to the National Environmental Policy Act (NEPA) process and in several cases exceeds the NEPA requirements, thereby providing a more conservative approach to estimating the proposed project emissions.

Annual mobile emissions from vehicle preparation and transport are summarized in Table C-9 which assumes 6 launches per year. Emission factors and calculation parameters are also provided in Table C-9. Finally, total annual mobile emissions for operation (and construction, see Section 1.5.2) of the worst-case scenario are presented in Table C-5.

Table C-5
Emissions from Mobile Sources of the Worst-Case Scenario

Activity	VOC	NO_x	CO	SO_x	PM_{10}
Mobile Sources from Operation					
Pounds per day	4.91	23.20	39.7	0.00	4.26
Tons per year [a]	0.21	0.34	3.48		0.04
Mobile Sources from Construction					
Pounds per day	3.54	14.11	27.86	0.00	2.65
Tons per year [b]	0.12	0.40	1.41		0.07

Notes: a Operation emissions are evaluated based on six Falcon launches per year.
b Construction activities would be completed in 2003.

1.5.1.2 Vehicle Fueling

Quantifiable emissions from vehicle fueling operations are mobile emissions only, and are generated during the transport of the fuel to SLC-3W. It is assumed that the fuel would be transported from a remote site to the SLC-3W. The following assumptions were made to estimate the emissions:

- One fuel truck is used to transport liquid oxygen (LOX) to SLC-3W: 12 trips per year (assuming 6 launches per year) at 100 miles per trip;
- One fuel truck is used to transport rocket propellant-1 (RP-1) to SLC-3W: 12 trips per year at 100 miles per trip;

Emission factor sources recommended by the South Coast Air Quality Management District (SCAQMD) were used to calculate resulting emissions. These annual mobile emissions from vehicle fueling are summarized in Table C-9 which assumes 6 launches per year. Emission factors and calculation parameters are also provided in Table C-9. Finally, total annual mobile emissions for operation (and construction – see Section 1.5.2) of the worst-case scenario are presented in Table C-5.

During the transfer of fuel from the transport truck to the storage tank and from the storage tank to the first and second stages, any emissions of LOX would be negligible and would not have a negative air quality impact. Emissions of RP-1 during fueling activities under the Evolved Expendable Launch Vehicle (EELV) Program were estimated in the Final Environmental Impact Statement (EIS) prepared for the EELV Program (published in 1998). The estimated emissions amounted to less than 50 pounds of RP-1 per year. Emission of RP-1 under the Falcon Launch Vehicle Program during fueling activities is anticipated to be much less due to the smaller-size vehicle. In addition, all fuel transfers would be performed using zero-leak quick disconnect fittings and the Regulation II for permitting would be

followed to ensure proper storage and handling of RP-1. Therefore, air emissions resulting from transferring LOX and RP-1 from the truck tank to storage tanks and from storage tanks to the first and second stages, would have no significant contribution to the overall emissions generated from operation of the Proposed Action.

Fugitive emissions resulting from the fueling process for the launch vehicle fueling operations are considered *de minimis* and are not included in the calculation of the mobile source emission category. Again, the purpose of this document is to calculate reasonably foreseeable emissions and compare the emissions to the conformity thresholds.

1.5.1.3 Wet Test and Vehicle Launch

For the worst-case scenario, a maximum of six launches of the Falcon would take place per year. Space X provided emission factors that were used to calculate the resulting emissions from launch of the Falcon engine. The following emission factors were used to calculate wet test and vehicle launch emissions:

- Carbon monoxide: 105.8 pounds per second;
- Carbon dioxide: 80.8 pounds per second;
- Hydrogen: 3.8 pounds per second; and
- Water: 4.4 pounds per second.

Since carbon dioxide, hydrogen and water are not regulated, only carbon monoxide emission factor is used in the following calculations.

The following assumptions were made to calculate wet test and vehicle launch emissions:

- Emission factors apply to first and second stage engines;
- Emissions from the second stage of the Falcon would not be larger than emissions from the first stage;
- The first stage would undergo one wet test;
- The second stage would undergo one wet test;
- Each wet test would last for 30 seconds; and
- Total vehicle launch would last 30 minutes (15 minutes for the first stage and 15 minutes for the second stage).

An example of the carbon monoxide emission calculations from the wet test of the first and second stages of the Falcon is as follows:

First Stage Emissions from the Wet Test

Total carbon monoxide emissions in pounds;

(105.8 pounds per second) x (30 seconds) = 3,174 pounds

Total carbon monoxide emissions in tons

(3,174 pounds) x (1 ton) / (2,000 pounds) =1.59 tons

Second Stage Emissions from the Wet Test

Testing of the second stage is assumed to generate the same amount of pollutants as testing of one first stage. The second stage would only undergo one wet test. Therefore emissions from the second stage would be equal to 1.59 tons.

Total Falcon Emissions from a Single Wet Test

(first stage wet test) + (second stage wet test) = (1.59 + 1.59) tons = 3.18 tons

Resulting wet test emissions from six trips are summarized in Table C-6.

First Stage Falcon Emissions from Vehicle Launch

Total carbon monoxide emissions per booster:

(105.8 pounds per second) x (60 seconds per minute) x (15 minutes) = 95,220 pounds

Total carbon monoxide emissions in tons

(95,220 pounds) x (1 ton) / (2,000 pounds) = 47.61 tons

Second Stage Falcon Emissions from Vehicle Launch

Total carbon monoxide emissions from the second stage are assumed to be equivalent to the emissions generated from one booster:

(105.8 pounds per second) x (60 seconds per minute) x (15 minutes) = 95,220 pounds

Total carbon monoxide emissions in tons

(95,220 pounds) x (1 ton) / (2,000 pounds) = 47.61 tons

Emissions from a Single Falcon Launch

(First stage) + (second stage) = 47.61 + 47.61 = 95.22 tons

Resulting vehicle launch emissions from 6 launches are summarized in Table C-6.

Table C-6
Annual Emissions from Wet Tests and Vehicle Launches (in tons per year)

Activity	VOC	NO_x	CO	SO_x	PM_{10}
Wet test of six Falcon vehicles per year	0.00	0.00	19.08	0.00	0.00
Launch of six Falcon vehicles per year	0.00	0.00	571.32	0.00	0.00

1.5.1.4 Point and Stationary Source Emissions

Point and stationary source emissions at SLC-3W were conservatively estimated based on three launches per year. Activities expected to contribute to these emissions include the possible sandblasting of the launch area followed by painting and coating after each launch and small parts cleaning using IPA. Expected emissions include PM_{10} generated during sandblasting, NO_x, CO, SO_x, and PM_{10} generated from the internal combustion of diesel fuel by a 150-HP engine used to run the compressor for sandblasting, and VOCs both from the painting and coating of the launch area and the small parts cleaning (using IPA). Details regarding the estimation of these emissions are included in Table C-7 and emissions are summarized in Table C-8.

Table C-7

Abrasive Blasting

Sandblasting	Media Usage[1] (lbs/hour)	Blast Time (hours/launch)	Frequency (launches/year)	PM_{10} Emission Factor[2] (lb/lb)	PM_{10} Emissions (lbs/year)	PM_{10} Emissions (tons/year)
Grit/Glass/Other	375	24	3	0.01	270	0.14
Internal Combustion Engines	Heat Input[3] (MMBtu/hour)	Blast Time (hours/launch)	Frequency (launches/year)	Emission Factor[4] (lbs/MMBtu)	Emissions (lbs/year)	Emissions (tons/year)
NO_x	1.2	24	3	3.85	333	0.17
CO				0.83	72	0.04
SO_x				0.26	22	0.01
PM_{10}				0.28	24	0.01

Coating and Painting Activities

Use of Organic	Usage[5] (gal/launch)	Frequency (launches/year)	VOC Emission Factor[6] (lb/gal)	VOC Emissions (lb/year)	VOC Emissions (tons/year)
Paint and Primer	25	3	2.1	157.5	0.08

Solvent Cleaning Activities

Use of Organic	Usage[7] (gal/launch)	Frequency (launches/year)	VOC Emission Factor[8] (lb/gal)	VOC Emissions (lb/year)	VOC Emissions (tons/year)
IPA	5	3	6.6	99	0.05

Space and Water Heating

None	N/A	N/A	N/A	N/A	N/A

Table C-7 (Continued)

Notes:

1 - 375 lbs/hour for three eight-hour days will be required to blast 3,000 square feet based on the estimate from abrasive blasting shop in SB County
2 - Sandblasting PM10 Emission Factors from SBCAPCD (from BAAQMD and SCAQMD), Grit/Glass/Other = 20 lbs per ton = 0.01 lbs/lb
3 - Heat input for a diesel-powered, internal combustion, 150HP engine (8000 BTU/BHP)
4 - AP-42 Emission Factors for diesel engines (g/BHP-hr*1 lb/454g*1 BHP-hr/800 BTU.1,000,000)
5 - Typical metal primer coverage is 200 square feet per gal and top coat coverage is 300 square feet per gal.
6 - Compliant coating VOC will be less than 250 g/L or 2.1 lb/gal
7 - Estimated by Space X
8 - For use of organic, the emission factor is the total VOC content of organic (e.g., assume 100% volatilization)

Table C-8
Estimated Point and Stationary Source Emissions

Activity	VOC	NO_x	CO	SO_x	PM_{10}
Point Sources (tons per year)	0.13	0.17	0.04	0.01	0.15

1.5.1.5 Privately Owned Vehicles and Site Maintenance

Annual emissions from privately-owned vehicles and maintenance of SLC-3W during operation of the worst-case scenario are calculated in Table C-9 and summarized in Table C-5 along with other mobile operation emissions. The following assumptions were made to complete the calculations:

- A maximum of 25 privately owned vehicles would be used for commuting to SLC-3W;
- The commute distance would be 1 miles per trip on surface roads and 20 miles per trip on highway; and
- Two trucks for water delivery (of domestic wastewater and industrial wastewater) would make a total of 48 trips.

1.5.2 Construction Emissions

Mobile emissions for construction are calculated in Table C-9 and summarized in Table C-5. Calculations for emissions resulting from site preparation (e.g., excavation, repaving) during construction of the SLC-3W launch pad are shown on Tables C-10 and C-11. Emissions from construction activities would not exceed thresholds for conformity when combined with all other emissions for the project for that year.

The following heavy-duty mobile vehicles would be used to complete this project (number and type):

2 Excavators	1 Concrete Pump
2 Backhoe/Skip Loader	1 Ready-Mix Truck
2 Rubber Tire Loaders	1 Crane
2 Scrapers	1 Water Truck
2 Motor Grader	2 Haul Trucks
2 Dozers	4 Pick-up Trucks
1 Steel Wheel Roller	1 Asphalt Truck
1 Hydraulic Saw	1 Asphalt Paver
1 Crusher	2 End Dump Truck

Specific activities associated with the refurbishment and reconstruction of SLC-3W would include the following:

- Routing power from the existing transformer on the northwest corner of the property to the pad. Estimated trench dimensions were 500 feet long, four feet deep, and four feet wide.
- Routing data lines from a blockhouse to the launch pad. Estimated trench dimensions were 500 feet long, 4 feet deep, and 4 feet wide for the section of line that would be underground.
- Tapping into the portable water main the eastern edge of the site and bring portable water to the launch pad. Estimated trench dimensions of 500 feet long, 4 feet deep, and 4 feet wide.
- Paving the existing dirt access road with estimated dimensions of 480 feet long and 20 feet wide with 6 inches of asphalt.
- Resurfacing the existing parking lot and use of existing road base.
- Refurbishing the building under and surrounding the launch pad by painting, installing wiring for lighting; data and phones lines; reinstalling plumbing for water supply and drains; installing heaters and air conditioning units, rebuilding walls where they are missing; installing carpet, and replacing doors and windows.
- Laying concrete pads (estimated dimensions are 6 to 10 inches deep and 60 feet by 60 feet area) to hold LOX, helium, RP-1, and nitrogen tanks.
- Installing lines and pumps for the fuel-loading system, oxidizer, pressurant and nitrogen.
- Installing lighting for safe operations after dark.
- Building a launch frame structure on the existing launch pad.
- Pouring concrete slab (estimated dimensions are 6 to 10 inches deep plus 102 feet by 90 feet) on the south side of the building for payload processing.

1.5.2.1 Assumptions for Construction Emissions

- The pickups, dump trucks, water trucks, haul trucks and workers' vehicles will travel an average of 10 miles on-site and 25 miles off-site per day.
- An average of 15 construction personnel will be commuting to the site.

Wind speed and direction frequency distributions for Vandenberg AFB and the Cities of Lompoc and Santa Ynez were used to calculate emissions and are provided in Tables C-12, C-13, and C-14, respectively.

Table C-9
Daily and Annual Mobile Source Emissions for Construction and Operation

Activity/Source	Emission Type	Fuel	Units	Days/ Year	VMT/day	VMT/ Year	NO_X (g/VMT)	NO_X lbs/day	NO_X lbs/year	SO_X (g/VMT)	SO_X lbs/day	SO_X lbs/year	(g/VMT)
PROJECT OPERATION													
Vehicle Preparation and Transport													
Components Trucks	On-site	Diesel	3	12	1	12	12.01	0.08	0.95	0.00	0.00	0.00	11.03
	Off-site	Diesel	3	12	100	1,200	13.69	9.05	108.65	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**9.13**	**109.60**		**0.00**	**0.00**	
Equipment Trucks	On-site	Diesel	1	6	1	6	12.01	0.03	0.16	0.00	0.00	0.00	11.03
	Off-site	Diesel	1	6	40	240	13.69	1.21	7.24	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.23**	**7.40**		**0.00**	**0.00**	
Helium&Nitrogen Trucks	On-site	Diesel	2	12	1	12	12.01	0.05	0.64	0.00	0.00	0.00	11.03
	Off-site	Diesel	2	12	100	1,200	13.69	6.04	72.43	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**6.09**	**73.07**		**0.00**	**0.00**	
Vehicle Fueling													
Fuel Trucks	On-site	Diesel	2	12	1	12	12.01	0.05	0.64	0.00	0.00	0.00	11.03
	Off-site	Diesel	2	12	100	1,200	13.69	6.04	72.43	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**6.09**	**73.07**		**0.00**	**0.00**	
Mobile Sources													
Water Truck	On-site	Diesel	1	48	1	48	12.01	0.03	1.27	0.00	0.00	0.00	11.03
	Off-site	Diesel	1	48	5	240	13.69	0.15	7.24	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**0.18**	**8.51**		**0.00**	**0.00**	
On-site Employees	25 Surface Road	Gas	25	240	1	240	0.90	0.05	11.90	0.00	0.00	0.00	8.87
	55 Highway	Gas	25	240	20	4,800	0.60	0.66	158.73	0.00	0.00	0.00	4.09
	Cold Start	Gas	25	240	4	960	2.77	0.61	146.56	0.00	0.00	0.00	93.49
	Hot Start	Gas	25	240	4	960	1.76	0.39	93.12	0.00	0.00	0.00	12.74
	Hot Soak	Gas	25	240	4	960	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal (g/veh/day)	Gas	25	240	1	240	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.71**	**410.32**		**0.00**	**0.00**	
Total Operation Emissions (pounds)								**23.20**	**674.58**		**0.00**	**0.00**	
Total Operation Emissions (Tons)								**0.01**	**0.34**		**0.00**	**0.00**	
Project Construction													
Excavation and Backfill													
Dump Truck	On-site	Diesel	2	10	10	100	12.01	0.53	5.30	0.00	0.00	0.00	11.03
	Off-site	Diesel	2	10	25	250	13.69	1.51	15.09	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**2.04**	**20.39**		**0.00**	**0.00**	
Water Truck	On-site	Diesel	1	30	10	300	12.01	0.26	7.94	0.00	0.00	0.00	11.03
	Off-site	Diesel	1	30	25	750	13.69	0.75	22.64	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.02**	**30.58**		**0.00**	**0.00**	
Haul Truck	On-site	Diesel	2	30	10	300	12.01	0.53	15.89	0.00	0.00	0.00	11.03
	Off-site	Diesel	2	30	25	750	13.69	1.51	45.27	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**2.04**	**61.16**		**0.00**	**0.00**	
Pick-Up Truck	On-site	Diesel	4	120	10	1,200	12.01	1.06	127.09	0.00	0.00	0.00	11.03
	Off-site	Diesel	4	120	25	3,000	13.69	3.02	362.17	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**4.08**	**489.26**		**0.00**	**0.00**	
Concrete/Paving													
Concrete Truck	On-site	Diesel	1	10	10	100	12.01	0.26	2.65	0.00	0.00	0.00	11.03
	Off-site	Diesel	1	10	50	500	13.69	1.51	15.09	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.77**	**17.74**		**0.00**	**0.00**	
Asphalt Truck	On-site	Diesel	1	5	10	50	12.01	0.26	1.32	0.00	0.00	0.00	11.03
	Off-site	Diesel	1	5	50	250	13.69	1.51	7.55	0.00	0.00	0.00	6.73
	Cold Start	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Hot Soak	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal	Diesel					0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.77**	**8.87**		**0.00**	**0.00**	
Construction Employee Commuting													
Construction Employee	25 Surface Road	Gas	15	120	10	1,200	0.90	0.30	35.71	0.00	0.00	0.00	8.87
	55 Highway	Gas	15	120	25	3,000	0.60	0.50	59.52	0.00	0.00	0.00	4.09
	Cold Start	Gas	15	120	4	480	2.77	0.37	43.97	0.00	0.00	0.00	93.49
	Hot Start	Gas	15	120	4	480	1.76	0.23	27.94	0.00	0.00	0.00	12.74
	Hot Soak	Gas	15	120	4	480	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Diurnal (g/veh/day)	Gas	15	120	1	120	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal								**1.39**	**167.14**		**0.00**	**0.00**	
Total ConstructionEmissions (pounds)								**14.11**	**795.14**		**0.00**	**0.00**	
Total Construction Emissions (tons)									**0.40**			**0.00**	
								0.000	**0.000**		**0.000**	**0.000**	

Table C-9
Daily and Annual Mobile Source Emissions for Construction and Operation

Activity/Source		CO lbs/day	CO lbs/year	PM_{10} (g/VMT)	PM_{10} lbs/day	PM_{10} lbs/year	HC (g/VMT)	HC lbs/day	HC lbs/year	Notes
PROJECT OPERATION										
Vehicle Preparation and Transport										
Components Trucks		0.07	0.88	2.63	0.02	0.21	2.78	0.02	0.22	a
		4.45	53.41	2.63	1.74	20.87	1.60	1.06	12.70	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**4.52**	**54.29**		**1.76**	**21.08**		**1.08**	**12.92**	
Equipment Trucks		0.02	0.15	2.63	0.01	0.03	2.78	0.01	0.04	a
		0.59	3.56	2.63	0.23	1.39	1.60	0.14	0.85	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**0.62**	**3.71**		**0.24**	**1.43**		**0.15**	**0.88**	
Helium&Nitrogen Trucks		0.05	0.58	2.63	0.01	0.14	2.78	0.01	0.15	a
		2.97	35.61	2.63	1.16	13.92	1.60	0.71	8.47	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**3.02**	**36.19**		**1.17**	**14.05**		**0.72**	**8.61**	
Vehicle Fueling										
Fuel Trucks		0.05	0.58	2.63	0.01	0.14	2.78	0.01	0.15	a
		2.97	35.61	2.63	1.16	13.92	1.60	0.71	8.47	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**3.02**	**36.19**		**1.17**	**14.05**		**0.72**	**8.61**	
Mobile Sources										
Water Truck		0.02	1.17	2.63	0.01	0.28	2.78	0.01	0.29	a
		0.07	3.56	2.63	0.03	1.39	1.60	0.02	0.85	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**0.10**	**4.73**		**0.03**	**1.67**		**0.02**	**1.14**	
On-site Employees	25	0.49	117.33	0.11	0.01	1.46	0.91	0.05	12.04	d
	55	4.51	1,082.02	0.11	0.12	29.10	0.12	0.13	31.75	d
		20.61	4,946.59	0.00	0.00	0.00	5.21	1.15	275.66	d
		2.81	674.08	0.00	0.00	0.00	1.38	0.30	73.02	d
		0.00	0.00	0.00	0.00	0.00	2.11	0.47	1.12	d
		0.00	0.00	0.00	0.00	0.00	5.01	0.28	2.65	d
	Subtotal	**28.42**	**6,820.02**		**0.13**	**30.56**		**2.38**	**396.23**	
Total Operation Emissions (pounds)		**39.07**	**6,951.42**		**4.26**	**81.42**		**4.91**	**427.52**	
Total Operation Emissions (Tons)		**0.02**	**3.48**		**0.00**	**0.04**		**0.00**	**0.21**	
Project Construction										
Excavation and Backfill										
Dump Truck		0.49	4.86	2.63	0.12	1.16	2.78	0.12	1.23	a
		0.74	7.42	2.63	0.29	2.90	1.60	0.18	1.76	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**1.23**	**12.28**		**0.41**	**4.06**		**0.30**	**2.99**	
Water Truck		0.24	7.30	2.63	0.06	1.74	2.78	0.06	1.84	a
		0.37	11.13	2.63	0.14	4.35	1.60	0.09	2.65	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**0.61**	**18.42**		**0.20**	**6.09**		**0.15**	**4.48**	
Haul Truck		0.49	14.59	2.63	0.12	3.48	2.78	0.12	3.68	a
		0.74	22.26	2.63	0.29	8.70	1.60	0.18	5.29	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**1.23**	**36.85**		**0.41**	**12.18**		**0.30**	**8.97**	
Pick-Up Truck		0.97	116.72	2.63	0.23	27.83	2.78	0.25	29.42	a
		1.48	178.04	2.63	0.58	69.58	1.60	0.35	42.33	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**2.46**	**294.76**		**0.81**	**97.41**		**0.60**	**71.75**	
Concrete/Paving										
Concrete Truck		0.24	2.43	2.63	0.06	0.58	2.78	0.06	0.61	a
		0.74	7.42	2.63	0.29	2.90	1.60	0.18	1.76	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**0.99**	**9.85**		**0.35**	**3.48**		**0.24**	**2.38**	
Asphalt Truck		0.24	1.22	2.63	0.06	0.29	2.78	0.06	0.31	a
		0.74	3.71	2.63	0.29	1.45	1.60	0.18	0.88	a
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	b
		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	c
	Subtotal	**0.99**	**4.93**		**0.35**	**1.74**		**0.24**	**1.19**	
Construction Employee Commuting										
Construction Employee	25	2.93	351.99	0.11	0.04	4.37	0.91	0.30	36.11	d
	55	3.38	405.76	0.11	0.09	10.91	0.12	0.10	11.90	d
		12.37	1,483.98	0.00	0.00	0.00	5.21	0.69	82.70	d
		1.69	202.22	0.00	0.00	0.00	1.38	0.18	21.90	d
		0.00	0.00	0.00	0.00	0.00	2.11	0.28	0.56	d
		0.00	0.00	0.00	0.00	0.00	5.01	0.17	1.33	d
	Subtotal	**20.37**	**2,443.94**		**0.13**	**15.28**		**1.72**	**154.50**	
Total ConstructionEmissions (pounds)		**27.86**	**2,821.03**		**2.65**	**140.23**		**3.54**	**246.26**	
Total Construction Emissions (tons)			**1.41**			**0.07**			**0.12**	
		0.000	**0.002**		**0.000**	**0.000**		**0.000**	**0.000**	

Table C-9
Daily and Annual Mobile Source Emissions for Operation and Construction

Notes:	a	-	EMFAC7F (emission factor in grams /mile)
	b	-	EMFAC7F (emissions in grams/start)
	c	-	EMFAC7F (emission factor in grams/day)
	d	-	SCAQMD CEQA Guidance Document
	CO	-	carbon monoxide
	g	-	grams
	HC	-	hydrocarbon is a volatile organic compound emission
	lbs	-	pounds
	NO_x	-	oxides of nitrogen
	PM_{10}	-	particulate matter 10 microns or less in diameter
	Sox	-	sulfur oxides
	VMT	-	vehicle miles traveled

Table C-10
Daily and Annual Construction Emissions from Site Preparation

Activity/Source		HP	Fuel	Units	Days/ year	Hrs/ day	Hrs/ year	NO_X lbs/hr	NO_X lbs/day	NO_X lbs/year	SO_X lbs/hr	SO_X lbs/day	SO_X lbs/year
Grading													
Motor Grader		156	Diesel	1	10	8	80	0.71	5.70	57.04	0.09	0.69	6.88
Scraper		267	Diesel	1	10	8	80	3.84	30.72	307.20	0.46	3.68	36.80
Rubber Tire Dozer		356	Diesel	2	10	8	80	7.48	119.62	1,196.16	0.71	11.39	113.92
	Subtotal							**12.03**	**156.04**	**1,560.40**	**1.26**	**15.76**	**157.60**
Trenching													
Hydraulic saw		23	Diesel	1	10	8	80	0.05	0.37	3.68	0.07	0.55	5.52
Motor Grader		156	Diesel	1	10	8	80	0.71	5.70	57.04	0.09	0.69	6.88
Excavator		151.7	Diesel	1	10	8	80	3.64	29.13	291.26	0.30	2.43	24.27
Rubber Tire Dozer		356	Diesel	2	10	8	80	7.48	119.62	1,196.16	0.71	11.39	113.92
	Subtotal							**4.40**	**35.20**	**1,548.14**	**1.17**	**15.06**	**150.59**
Backfill and Compact													
FE Loader/Backhoe		79	Diesel	1	10	8	80	1.89	15.12	151.20	0.18	1.46	14.56
Plate Compactor		8	Diesel	1	10	8	80	0.16	1.28	12.80	0.02	0.13	1.28
Motor Grader		156	Diesel	1	10	8	80	0.71	5.70	57.04	0.09	0.69	6.88
Rubber Tire Dozer		356	Diesel	1	10	8	80	7.48	59.81	598.08	0.71	5.70	56.96
	Subtotal							**10.24**	**81.91**	**819.12**	**1.00**	**7.97**	**79.68**
Road Paving													
Asphalt Paver		145	Diesel	1	10	8	80	3.34	26.68	266.80	0.29	2.32	23.20
Steel Wheel Roller		99	Diesel	1	10	8	80	0.87	6.96	69.60	0.07	0.54	5.36
Asphalt				1,130	10	8	80						
Asphalt Truck			Diesel	1	10	8	80	4.17	33.36	333.60	0.45	3.60	36.00
	Subtotal							**8.38**	**67.00**	**670.00**	**0.81**	**6.46**	**64.56**
Concrete Pad													
Crusher		127	Diesel	1	10	8	80	3.05	24.38	243.84	1.26	10.08	100.79
Concrete Vibrator		10	Diesel	1	10	8	80	0.24	1.92	19.20	0.02	0.16	1.60
Concrete Pump		11	Diesel	1	5	8	40	0.26	2.11	10.56	0.02	0.18	0.88
Concrete Mixer		11	Diesel	1	5	8	40	0.26	2.11	10.56	0.02	0.18	0.88
Cement Finisher		5	Diesel	1	5	8	40	0.12	0.96	4.80	0.01	0.08	0.40
	Subtotal							**3.94**	**31.49**	**288.96**	**1.33**	**10.67**	**104.55**
Structure Refurbishing													
Crane		194	Diesel	1	10	8	80	4.46	35.70	356.96	0.39	3.10	31.04
	Subtotal							**4.46**	**35.70**	**356.96**	**0.39**	**3.10**	**31.04**
Total Emissions								**43.44**	**407.33**	**5,243.58**	**5.95**	**59.02**	**588.02**

Table C-10
Daily and Annual Construction Emissions from Site Preparation

Activity/Source		CO			PM_{10}			HC (a)			Notes
		lbs/hr	lbs/day	lbs/year	lbs/hr	lbs/day	lbs/year	lbs/hr	lbs/day	lbs/year	
Grading											
Motor Grader		0.15	1.21	12.08	0.06	0.49	4.88	0.04	0.31	3.12	b
Scraper		1.25	10.00	100.00	0.41	3.28	32.80	0.27	2.16	21.60	b
Rubber Tire Dozer		3.56	56.96	569.60	0.18	2.85	28.48	0.71	11.39	113.92	c
	Subtotal	**4.96**	**68.17**	**681.68**	**0.65**	**6.62**	**66.16**	**1.02**	**13.86**	**138.64**	
Trenching											
Hydraulic saw		0.05	0.37	3.68	0.02	0.18	1.84	0.05	0.37	3.68	c
Motor Grader		0.46	3.68	36.80	0.06	0.49	4.88	0.04	0.31	3.12	b
Excavator		1.52	12.14	121.36	0.76	6.07	60.68	0.15	1.21	12.14	
Rubber Tire Dozer		3.56	56.96	569.60	0.18	2.85	28.48	0.71	11.39	113.92	c
	Subtotal	**5.58**	**73.14**	**731.44**	**1.02**	**9.59**	**95.88**	**0.95**	**13.29**	**132.86**	
Backfill and Compact											
FE Loader/Backhoe		0.57	4.58	45.76	0.17	1.38	13.76	0.23	1.84	18.40	b
Plate Compactor		0.06	0.45	4.48	0.01	0.06	0.64	0.02	0.13	1.28	c
Motor Grader		0.15	1.21	12.08	0.06	0.49	4.88	0.04	0.31	3.12	b
Rubber Tire Dozer		3.56	28.48	284.80	0.18	1.42	14.24	0.71	5.70	56.96	c
	Subtotal	**4.34**	**34.71**	**347.12**	**0.42**	**3.35**	**33.52**	**1.00**	**7.98**	**79.76**	
Road Paving											
Asphalt Paver		1.02	8.12	81.20	0.15	1.16	11.60	0.15	1.16	11.60	b
Steel Wheel Roller		0.30	2.40	24.00	0.05	0.40	4.00	0.07	0.52	5.20	c
Asphalt								0.04	4.52	45.20	d
Asphalt Truck		1.80	14.40	144.00	0.26	2.08	20.80	0.19	1.52	15.20	
	Subtotal	**3.12**	**24.92**	**249.20**	**0.46**	**3.64**	**36.40**	**0.44**	**7.72**	**77.20**	
Concrete Pad											
Crusher		12.60	100.79	1,007.87	0.94	7.56	75.59	1.89	15.12	151.18	
Concrete Vibrator		0.20	1.60	16.00	0.02	0.12	1.20	0.03	0.24	2.40	c
Concrete Pump		0.22	1.76	8.80	0.02	0.13	0.66	0.03	0.26	1.32	c
Concrete Mixer		0.22	1.76	8.80	0.02	0.13	0.66	0.03	0.26	1.32	c
Cement Finisher		0.05	0.40	2.00	0.01	0.04	0.20	0.01	0.08	0.40	c
	Subtotal	**13.29**	**106.31**	**1,043.47**	**1.00**	**7.98**	**78.31**	**2.00**	**15.97**	**156.62**	
Structure Refurbishing											
Crane		1.75	13.97	139.68	0.29	2.33	23.28	0.58	4.66	46.56	c
	Subtotal	**1.75**	**13.97**	**139.68**	**0.29**	**2.33**	**23.28**	**0.58**	**4.66**	**46.56**	
Total Emissions		**33.03**	**321.22**	**3,192.59**	**3.83**	**33.51**	**333.55**	**5.98**	**63.47**	**631.64**	

Table C-10
Daily and Annual Construction Emissions from Site Preparation

Notes:	a	-	Hydrocarbon emissions are the sum of hydrocarbon and aldehyde emission factors.
	b	-	EPA AP-42, Vol. II Mobil Source, Table II-7.1.
	c	-	SCAQMD CEQA guidance document.
	d	-	Units expressed in tons of asphalt needed. Emission factor from SBCAPCD.
	CO	-	carbon monoxide
	HC	-	hydrocarbon (a volatile organic compound emission)
	hr	-	hour
	lbs	-	pounds
	NOx	-	oxides of nitrogen
	PM	-	particulate matter 10 microns or less in diameter
	proj.	-	project
	SOx	-	sulfur oxides

Table C-11
Site Preparation PM_{10} Emissions

Vehicle Type	Travel Route	Duration (days)	Number of Units	VMT/day	Emission Factor (lbs/VMT)[1]	PM_{10} (lbs/day)	PM_{10} (lbs/year)	PM_{10} (tons/year)	Emission Factor Criteria
Passenger	surface road	120	15	10	0.018	2.70	324.00	0.16	Passenger vehicle on paved road with street cleaning
Passenger	highway	120	15	25	0.018	6.75	810.00	0.41	Passenger vehicle on paved road with street cleaning
Dump Truck[2]	unpaved road	10	4	10	6.540	261.60	2,616.00	1.31	Trucks on unpaved roadway
Water Truck[2]	unpaved road	30	2	25	6.540	327.00	9,810.00	4.91	Trucks on unpaved roadway
Haul Truck[2]	unpaved road	30	1	10	6.540	65.40	1,962.00	0.98	Trucks on unpaved roadway
Dump Truck	surface road	10	4	25	0.400	40.00	400.00	0.20	Trucks on paved roadways with street cleaning
Water Truck	surface road	30	2	10	0.400	8.00	240.00	0.12	Trucks on paved roadways with street cleaning
Haul Truck	surface road	30	1	25	0.400	10.00	300.00	0.15	Trucks on paved roadways with street cleaning
Bulldozing[3]	-	30	-	8	21.800	174.40	5,232.00	2.62	Dirt/debris pushing operations
Scraping	-	10	1	30	4.300	129.00	1,290.00	0.65	Earthmoving (cut and fill operations, and pan scraper operations)
Grading[4]	-	10	-	0.012	26.400	0.32	3.17	0.00	Graded surface
Wind Erosion[4]	-	20	-	0.012	85.600	1.03	20.54	0.01	Open storage piles
Dirt Piling or Material Handling[5]	-	20	-	5	0.009075	0.05	0.91	0.00	Storage pile filling or truck dumping
Total PM_{10} Emissions						**1,026.24**	**23,008.62**	**11.50**	

Notes:

1 - Emission factors are from SCAQMD CEQA Air Quality Handbook 1993, Table A9-9 (default values).
2 - Emission factors are from SCAQMD CEQA Air Quality Handbook 1993, Table A9-9D with average mean vehicle weight of 13 tons.
3 - Emission factor is expressed in lbs/hour; therefore, VMT/day is expressed in hrs/day.
4 - Emission factors is expressed in lbs/day/acre; therefore, VMT/day is expressed in acre/day.
5 - Emission factors is expressed in lbs/ton of material handled; therefore, VMT/day is expressed in tons/day.

Table C-12
Wind Speed and Direction Frequency Distribution for Vandenberg AFB

	DIRECTION																	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	FREQUENCY (%)
3.000	2.9	3.6	2.7	1.9	1.1	0.6	0.9	0.5	0.6	0.4	0.6	0.9	1.9	2.5	2.1	2.7	0.5	56.4
6.000	22.3	10.2	3.4	2.1	0.1	0.3	1.3	1.2	0.7	0.4	0.3	0.5	0.2	0.4	2.1	9.6	0.0	54.9
9.000	5.5	0.9	0.2	0.2	0.0	0.2	2.1	0.4	0.1	0.0	0.0	0.0	0.0	0.1	1.0	5.0	0.0	15.8
9.000	0.0	0.0	0.0	0.0	0.4	1.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	2.9
FREQUENCY (%)	30.7	14.7	6.3	4.3	1.2	1.4	5.8	2.2	1.4	0.8	0.9	1.4	2.2	3.0	5.7	17.6	0.5	100.0
AVERAGE	4.8	3.9	3.1	3.2	1.5	5.6	7.1	4.6	3.4	3.2	2.4	2.5	2.2	2.5	4.3	5.0	0.2	

NOTES:
Number of valid hours: 7,056
Time of Report: 21 March 2002, 09:18
Period: 1 January 2001 00:00 to 31 December 2001 23:00
Site: Vandenberg AFB (VAFBSTS)
Source: Santa Barbara County Air Pollution Control District

Table C-13
Wind Speed and Direction Frequency Distribution for the City of Lompoc

	DIRECTION																	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	FREQUENCY (%)
3.000	1.0	0.9	1.2	1.3	1.5	2.2	2.4	2.0	2.4	3.3	3.3	4.7	17.2	18.8	6.3	1.9	6.9	77.4
6.000	0.1	0.0	0.0	0.0	0.0	0.3	2.2	0.5	0.1	0.0	0.0	0.1	9.8	6.3	1.7	0.5	0.0	21.7
9.000	.0.	0.0	0.0	0.0	0.0	0.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
9.000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
FREQUENCY (%)	1.1	0.9	1.2	1.3	1.5	2.6	5.4	2.5	2.5	3.3	3.4	4.8	27.0	25.1	8.1	2.4	6.9	100.0
AVERAGE	1.1	0.8	0.8	0.8	0.8	1.8	3.8	1.6	1.0	0.9	0.8	1.0	2.5	2.3	2.1	1.8	0.2	

NOTES:
Number of valid hours: 8723
Time of report 21 Mar 2002 09:22
Period: 01 Jan-2001 00:00 To 31-Dec-2001 23:00
Source: Santa Barbara County Air Pollution Control District

Table C-14
Wind Speed and Direction Frequency Distribution for the City of Santa Ynez

	DIRECTION																	
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	FREQUENCY (%)
3.000	6.0	4.4	4.6	3.0	2.5	1.5	1.1	0.9	1.4	3.3	11.0	10.8	7.2	3.1	3.4	2.9	3.5	70.4
6.000	1.4	0.1	0.0	0.0	0.8	1.1	0.3	0.1	0.4	0.6	2.2	7.2	7.4	0.7	2.1	1.0	0.0	25.3
9.000	0.1	0.0	0.0	0.0	0.4	0.3	0.1	0.1	0.2	0.2	0.1	1.3	0.4	0.0	0.3	0.4	0.0	4.1
9.000	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
FREQUENCY	7.5	4.5	4.6	3.0	3.7	3.0	1.6	1.1	2.0	4.2	13.3	19.2	14.9	3.8	5.8	4.2	3.5	100.0
AVERAGE	1.9	1.1	1.1	1.2	2.6	3.3	2.5	1.9	2.3	2.0	2.1	3.0	3.0	1.8	2.7	2.4	0.2	

NOTES:
Number of valid hours: 8624
Time of report: 21-Mar-2002 09:20
Period: 01 Jan 2001 00:00 To 31 Dec 2001 23:00
Source: Santa Barbara County Air Pollution Control District

D ENGINE NOISE MODELING DATA

==> Noise source: **FALCON STAGE 1 ROCKET**

==> Basic sound level drop-off rate:	**6.00**	dB/doubling
==> Atmospheric absorption coefficient:	**0.22**	dB/100 meters
==> Reference Level (SEL, Lmax, Leq, Ldn):	**145.00**	**Peak dB**
==> Distance for Reference Noise Level:	**200.00**	Feet
	60.96	Meters

DISTANCE ATTENUATION:

Receptor Distance (feet)	Lpk Value (dB) at Receptor
100	151.1
200	145.0
300	141.4
400	138.9
500	136.9
600	135.2
700	133.8
800	132.6
900	131.5
1,000	130.5
1,500	126.7
2,000	123.9
3,000	119.7
4,000	116.5
5,000	113.9
5,280	113.3
7,500	108.7
7,920	108.0
9,000	106.1
10,000	104.6
10,560	103.7
13,200	100.0
15,840	96.7
18,480	93.6
21,120	90.6
23,760	87.8
26,400	85.2
29,040	82.6
31,680	80.0
34,320	77.6
36,960	75.2
39,600	72.8
42,240	70.5
44,880	68.2
47,520	65.9
52,800	61.5

DISTANCE TO dB CONTOURS:

Lpk Noise Contour Value (dB)	Contour Distance (feet)
150	113
145	200
140	354
135	614
130	1,050
125	1,843
120	2,944
115	4,767
110	7,189
105	9,884
100	13,205
95	18,056
90	21,314
85	26,451
80	31,695
75	37,015
70	42,393

Contour distance calculations are most accurate within the decibel range of the direct attenuation calculations.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its incremental noise level contribution is significantly less than background noise levels.

Notes: Drop-off calculations include atmospheric absorption at 0.22 dB/100 meters, centered at the reference distance.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its incremental noise level contribution is significantly less than background noise levels.

Contour distance calculations are most accurate within the decibel range of the direct attenuation calculations.

==> Noise source:	**ATLAS IIAS MLV10-9/8/01 Launch**	
==> Basic sound level drop-off rate:	**6.00**	dB/doubling
==> Atmospheric absorption coefficient:	**0.22**	dB/100 meters
==> Reference Level (SEL, Lmax, Leq, Ldn):	**118.00**	**Peak dB**
==> Distance for Reference Noise Level:	**32,472.00**	Feet
	9,897.47	Meters

DISTANCE ATTENUATION:

Receptor Distance (feet)	Lpk Value (dB) at Receptor
100	189.8
200	183.7
300	180.1
400	177.6
500	175.6
600	173.9
700	172.5
800	171.3
900	170.2
1,000	169.2
1,500	165.4
2,000	162.6
3,000	158.4
4,000	155.2
5,000	152.6
5,280	152.0
7,500	147.4
7,920	146.7
9,000	144.8
10,000	143.3
10,560	142.4
13,200	138.7
15,840	135.4
18,480	132.3
21,120	129.3
23,760	126.5
26,400	123.9
29,040	121.3
31,680	118.7
34,320	116.3
36,960	113.9
39,600	111.5
42,240	109.2
44,880	106.9
47,520	104.6
52,800	100.2

DISTANCE TO dB CONTOURS:

Lpk Noise Contour Value (dB)	Contour Distance (feet)
190	97
185	172
180	304
175	534
170	922
165	1,568
160	2,488
155	4,102
150	6,620
145	8,842
140	11,379
135	16,525
130	19,560
125	23,152
120	11,259
115	35,087
110	41,976

Contour distance calculations are most accurate within the decibel range of the direct attenuation calculations.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its incremental noise level contribution is significantly less than background noise levels.

Notes: Drop-off calculations include atmospheric absorption at 0.22 dB/100 meters, centered at the reference distance.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its incremental noise level contribution is significantly less than background noise levels.

Contour distance calculations are most accurate within the decibel range of the direct attenuation calculations.

E SONIC BOOM NOISE MODELING DATA

Space Exploration Technologies Contract 1473-16213, Task 4

SONIC BOOM ANALYSIS FOR FALCON LAUNCH VEHICLE

Presented to
Space Exploration Technologies
May 2, 2003

Performing Organization:
Flight Mechanics Department
Vehicle Systems Division

Coordinating Organization:
Space Launch Projects
Space Launch Support Division

Outline

- Introduction
- Study Approach
  - use of PCBoom3
- Results
  - Isopemps
  - Peak overpressure contours
- Reference comparison against Atlas IIAS and Titan IVB

SpaceX Task 4

- Contract: 1473-16213, Task 4
- Subject: Sonic Boom Analysis of Falcon Launch Vehicle
- Purpose: To provide Space X with overpressure and isopemp contours of Falcon for launch out of Vandenberg Air Force Base.
- Duration: April 14, 2003 - April 30, 2003
- SpaceX COTR: Gwynne Gurevich
- Aerospace PM: Jared Martin
- Aerospace Technical Task Leader: Rolf Bohman, Jeff Tooley
- Aerospace Contracts: Jerome Johnson

Statement of Work

Objective:

To perform a sonic boom analysis of the Falcon launch vehicle for launch out of Vandenberg Air Force Base. This analysis has been requested by the Air Force to examine potential environmental impacts associated with the overpressures produced by the launch of the Falcon from VAFB.

Deliverable:

Overpressure and isopemp contours plotted on a geographical information system. A brief description of the methodology used for the creation of the contours along with a description of the results will also be included.

Study Approach

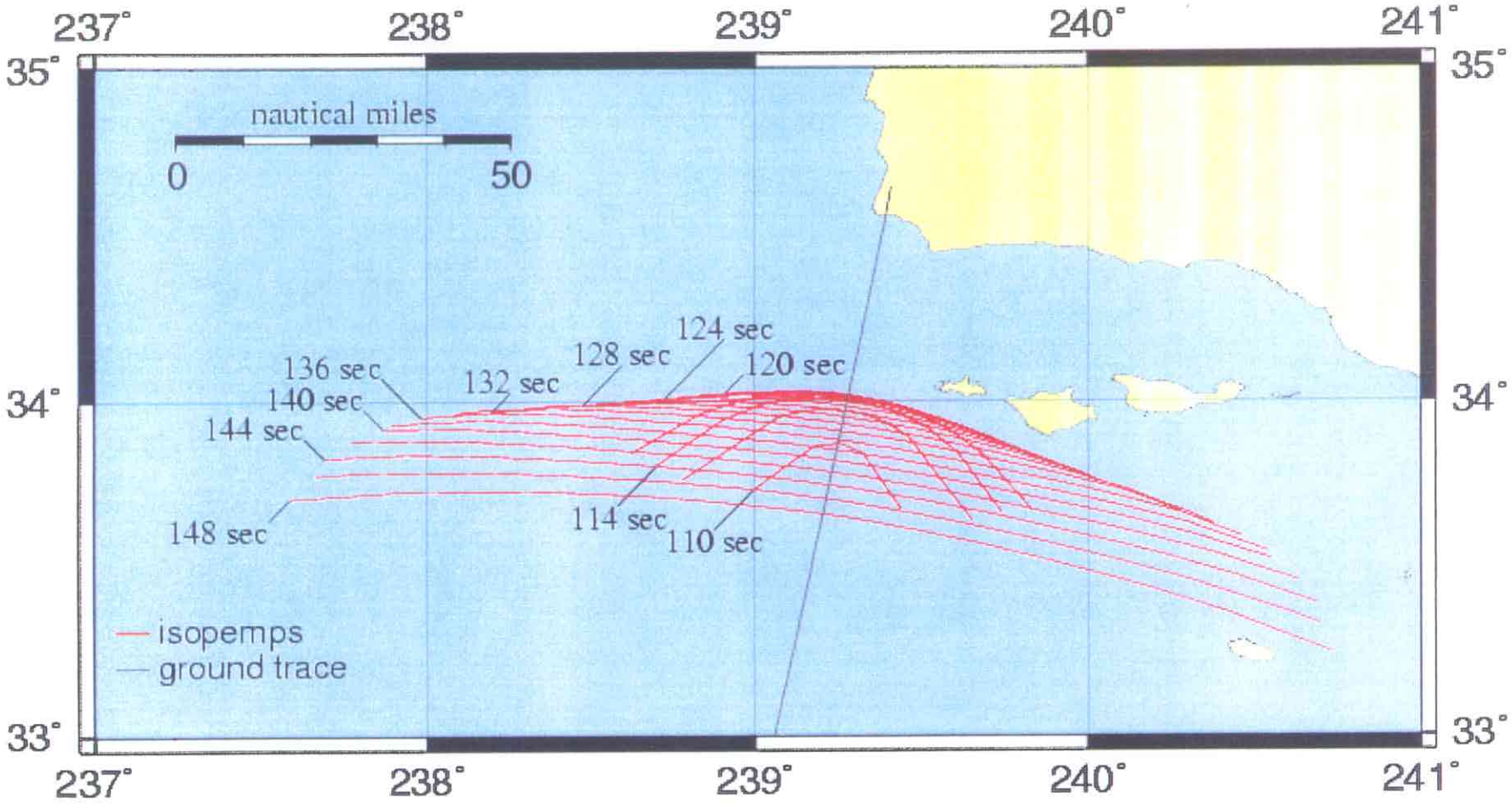
- PCBoom3* used for sonic boom calculations
  - In response to request from VAFB Range Safety
- PCBoom3 has been used by Aerospace for sonic boom assessment of Titan, Atlas, and Minuteman III launches
- Inputs included in Falcon sonic boom analysis:
  - Trajectory data and vehicle description
  - Atmospheric data
    - Two atmospheric cases are run
      - 1971 Vandenberg standard atmosphere model is used with no winds
      - December atmosphere with mean (nominal) December winds
        - » Reference: Meteorology Group Range Commanders Council Document 362-83, *Range Reference Atmosphere 0-70 km*, April 1983.
  - Launch vehicle near-field signature
    - PCBoom3 has canned near field signatures based on the vehicle length, weight, shape, and plume description (vehicle plume drag was estimated as 25% of thrust)
    - For this analysis these canned signatures are used

**PCBoom3 Sonic Boom Prediction Model – Version 1.0e*, Wyle Laboratories, Wyle Research Report: WR 95-22E, Plotkin, K.J.; October 1998.

Discussion of Isopemp Plot

- Isopemps are the intersection of the ray cone (a cone perpendicular to the wave cone) and the ground
- The time labels denote the launch time when the ray cone associated with each isopemp was generated by the launch vehicle
- Isopemps are shown from 110 seconds to 148 seconds and are plotted out every two seconds
- Before 110 seconds no isopemps impact the ground
- After 148 seconds the associated overpressures are low, so the isopemps are not shown
- The largest overpressures will result where the isopemps begin overlapping
  - This occurs at the most uprange isopemps
  - This overlapping of isopemps is called focusing
  - On the figure these are the isopemps generated by the launch vehicle between 118 and 132 seconds

Isopemp Plot with No Winds
190° Launch Azimuth

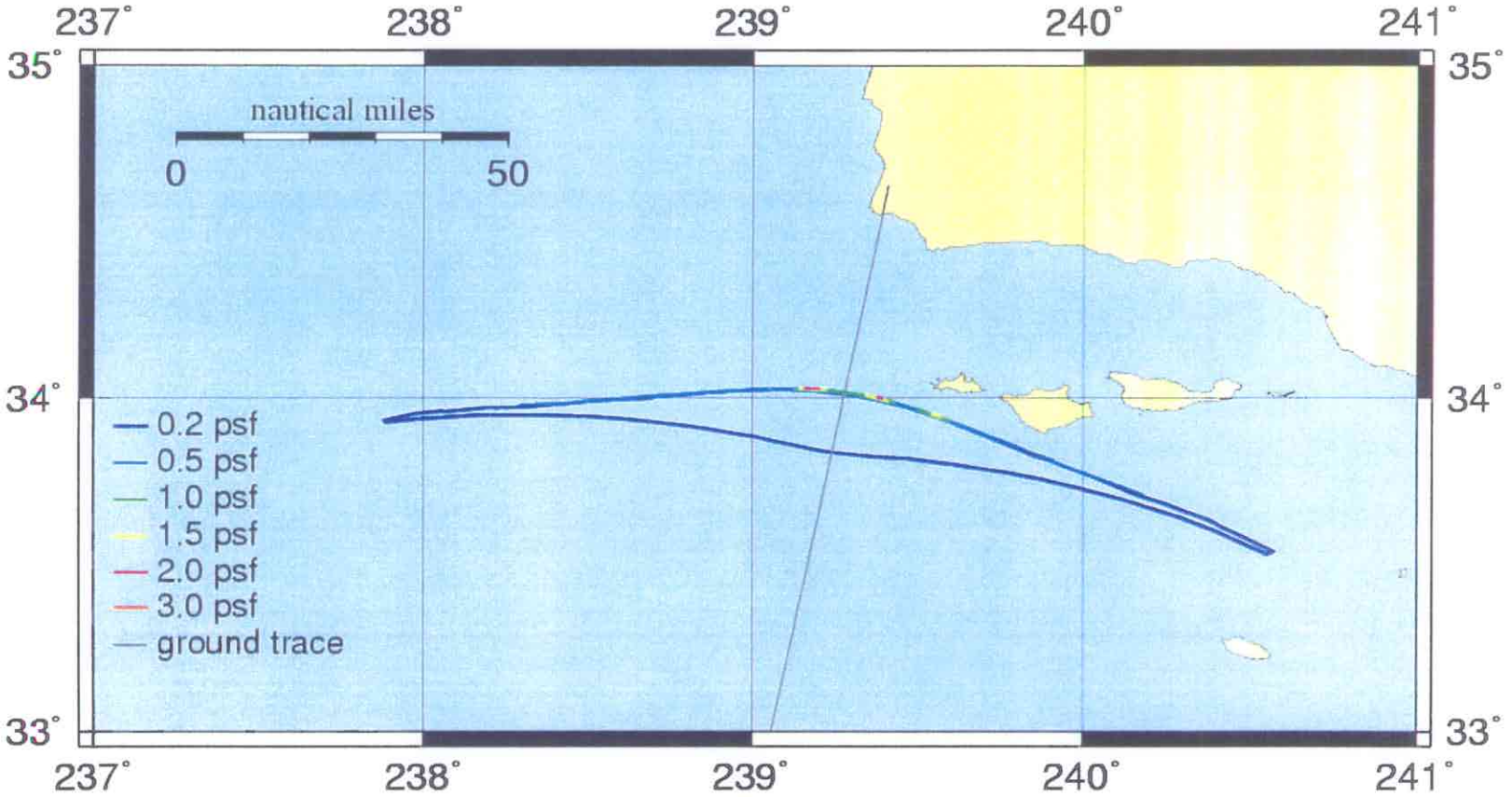


Peak Overpressure Contour Maps

- The following plots are based on a 1971 Vandenberg standard atmosphere model with no winds
- Atmospheric conditions are averaged across the year

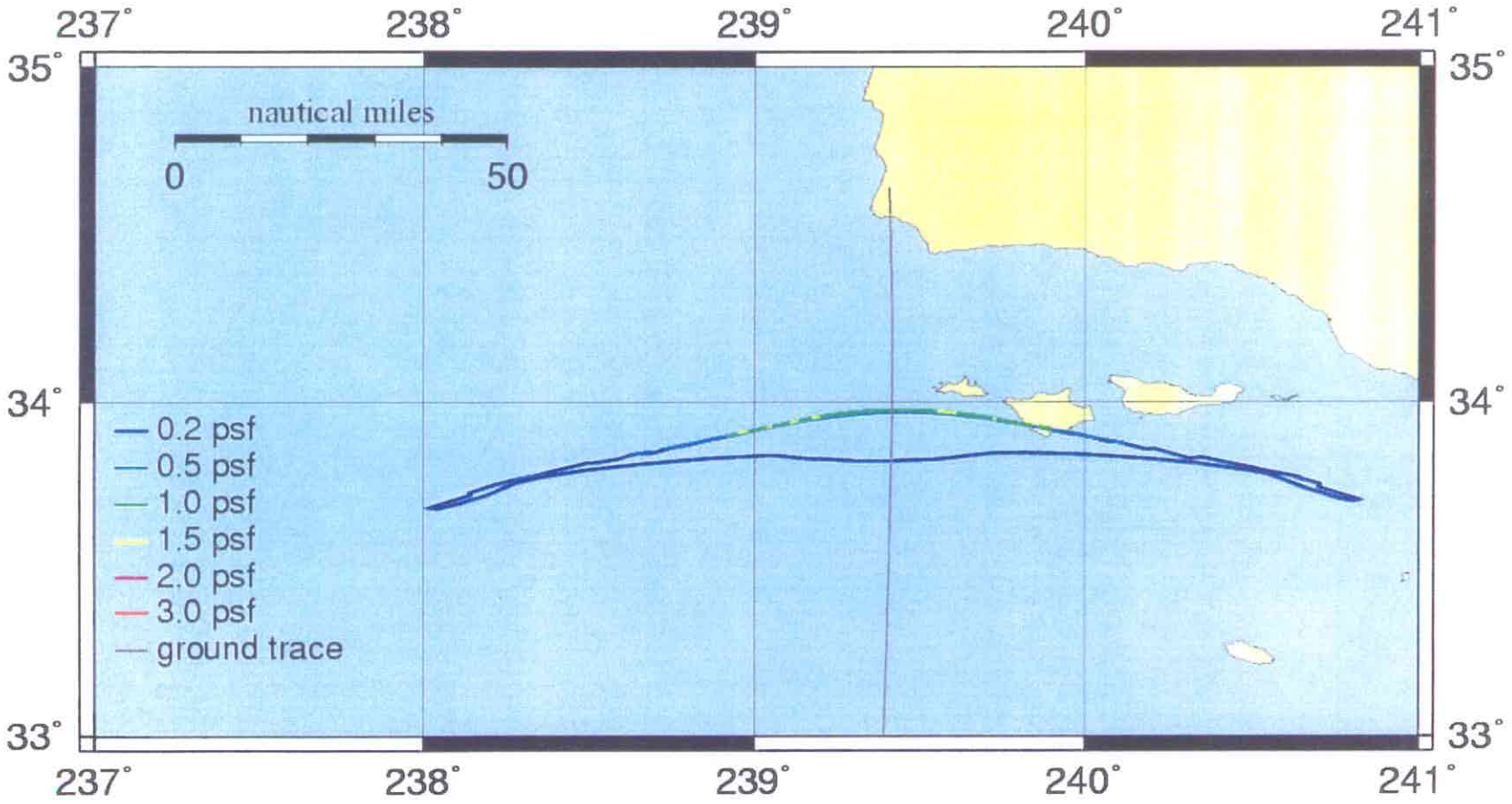
Peak Overpressure Contours for Vandenberg Standard Atmosphere with No Winds - 190° Launch Azimuth

Largest peak overpressure of 2.66 psf



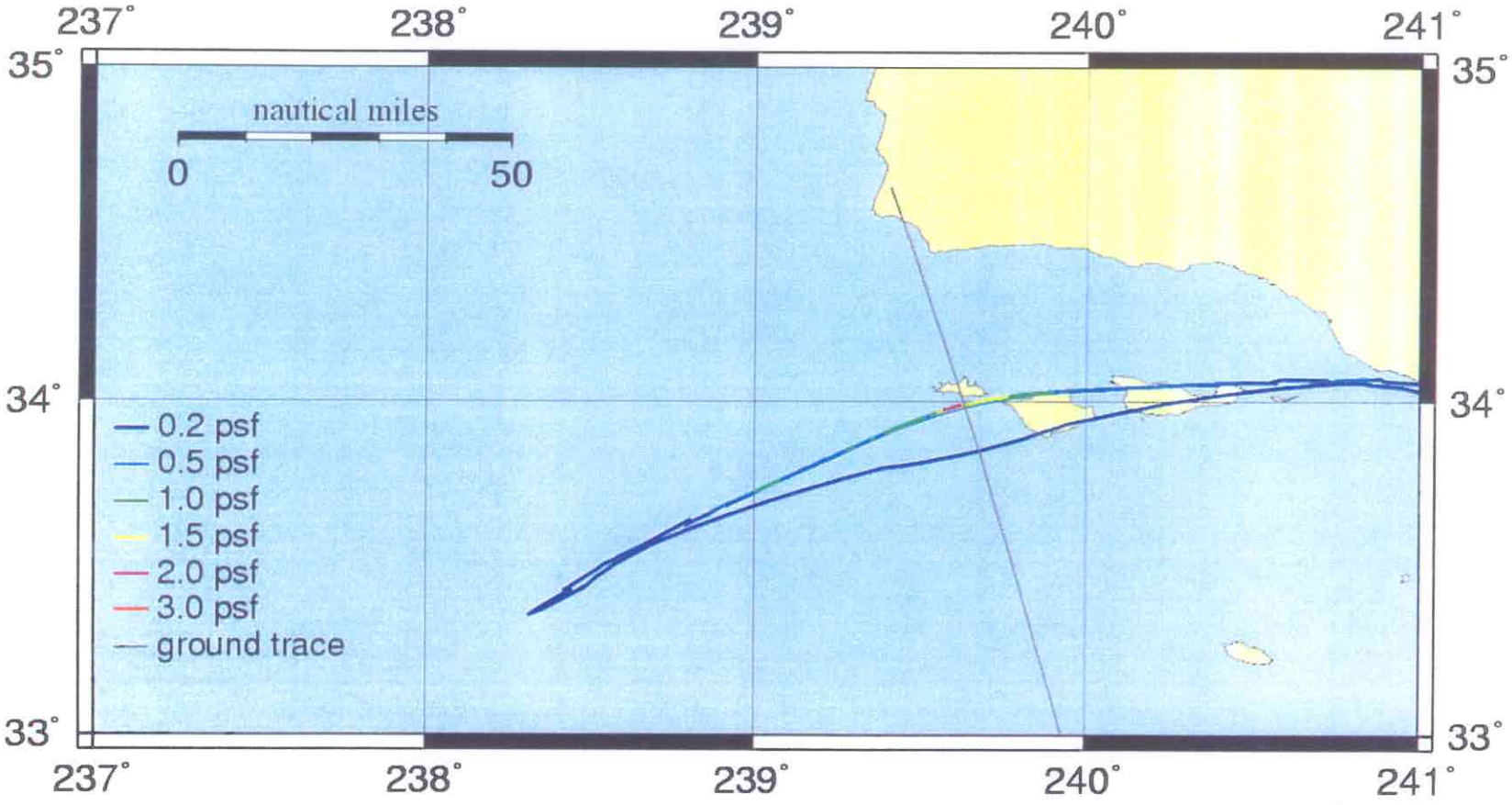
Peak Overpressure Contours for Vandenberg Standard Atmosphere with No Winds - 175° Launch Azimuth

Largest peak overpressure of 1.79 psf



Peak Overpressure Contours for Vandenberg Standard Atmosphere with No Winds - 160° Launch Azimuth

Largest peak overpressure of 2.50 psf



Discussion of Peak Overpressure Contours Year Average Atmospheric Conditions, No Winds

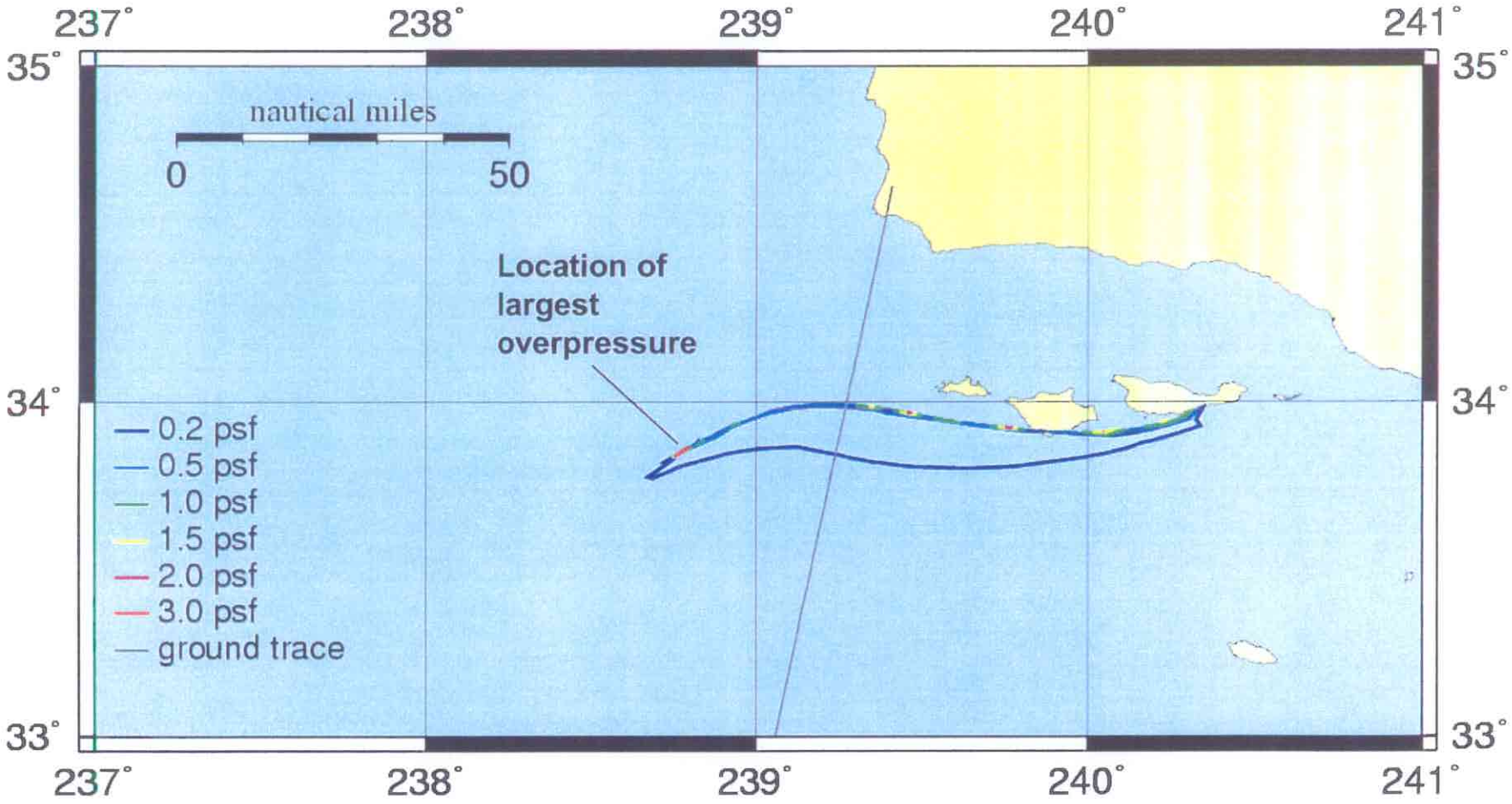
- Overpressure levels (on Islands) considered high for ≥ 2 psf
- Without winds, for 190° launch azimuth, Falcon overpressure does not impinge on Channel Islands
- Without winds, for 175° launch azimuth, there is an overpressure level of 1.0 psf on Santa Rosa
- Without winds, for 160° launch azimuth, the largest overpressure on the islands is 1.0-1.5 psf, on Santa Rosa

Peak Overpressure Contour Maps- December

- The following plots use the data for the average (mean) winds in December
  - Simulations accounting for the variability in the December wind conditions (+/- 3 sigma) have also been run

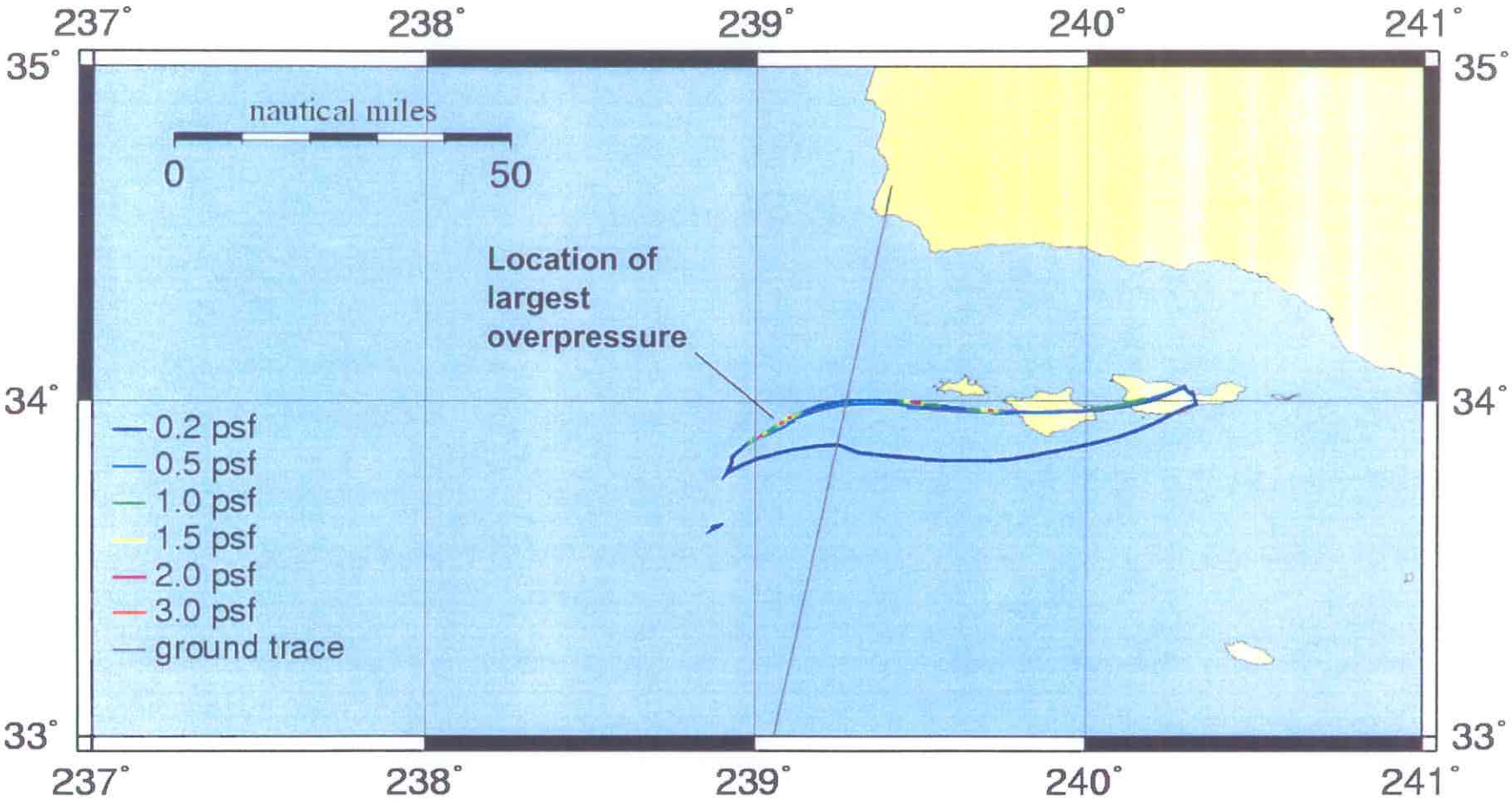
Peak Overpressure Contours for December Atmosphere and December Mean Winds - 190° Launch Azimuth

Largest peak overpressure of 7.05 psf



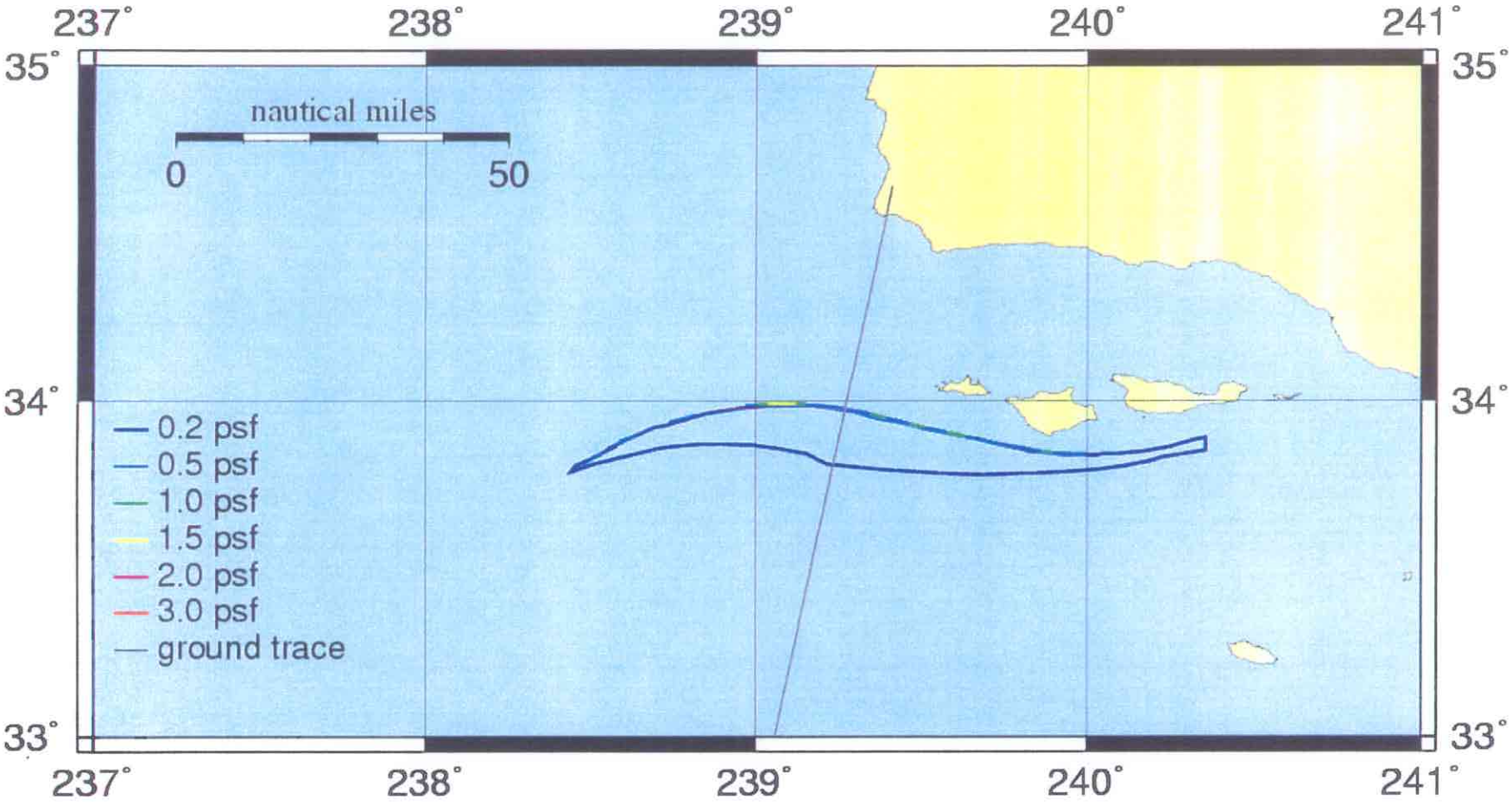
Peak Overpressure Contours for December Atmosphere and December +3 Sigma Winds - 190° Launch Azimuth

Largest peak overpressure of 3.95 psf



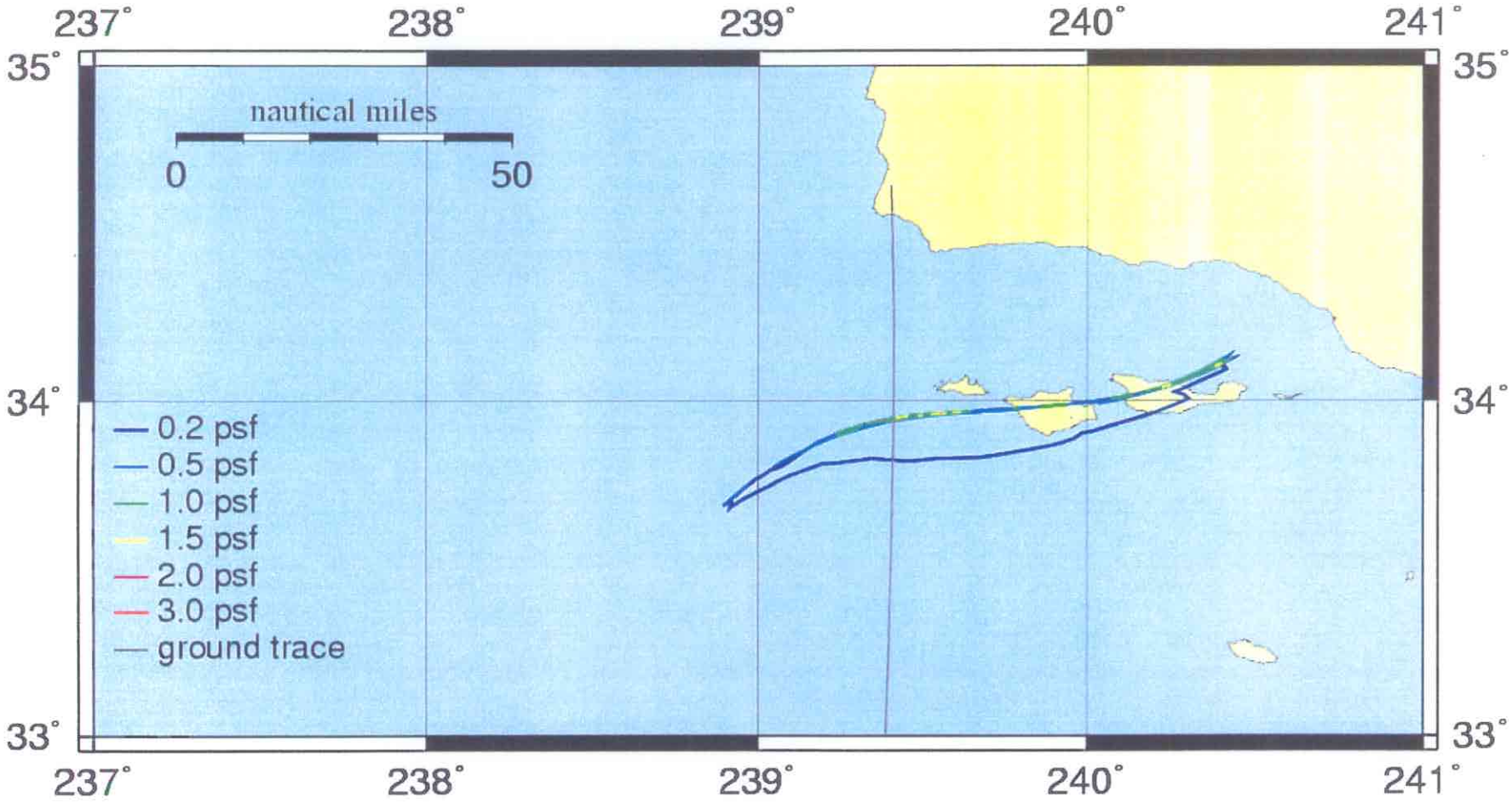
Peak Overpressure Contours for December Atmosphere and December –3 Sigma Winds - 190° Launch Azimuth

Largest peak overpressure of 1.87 psf



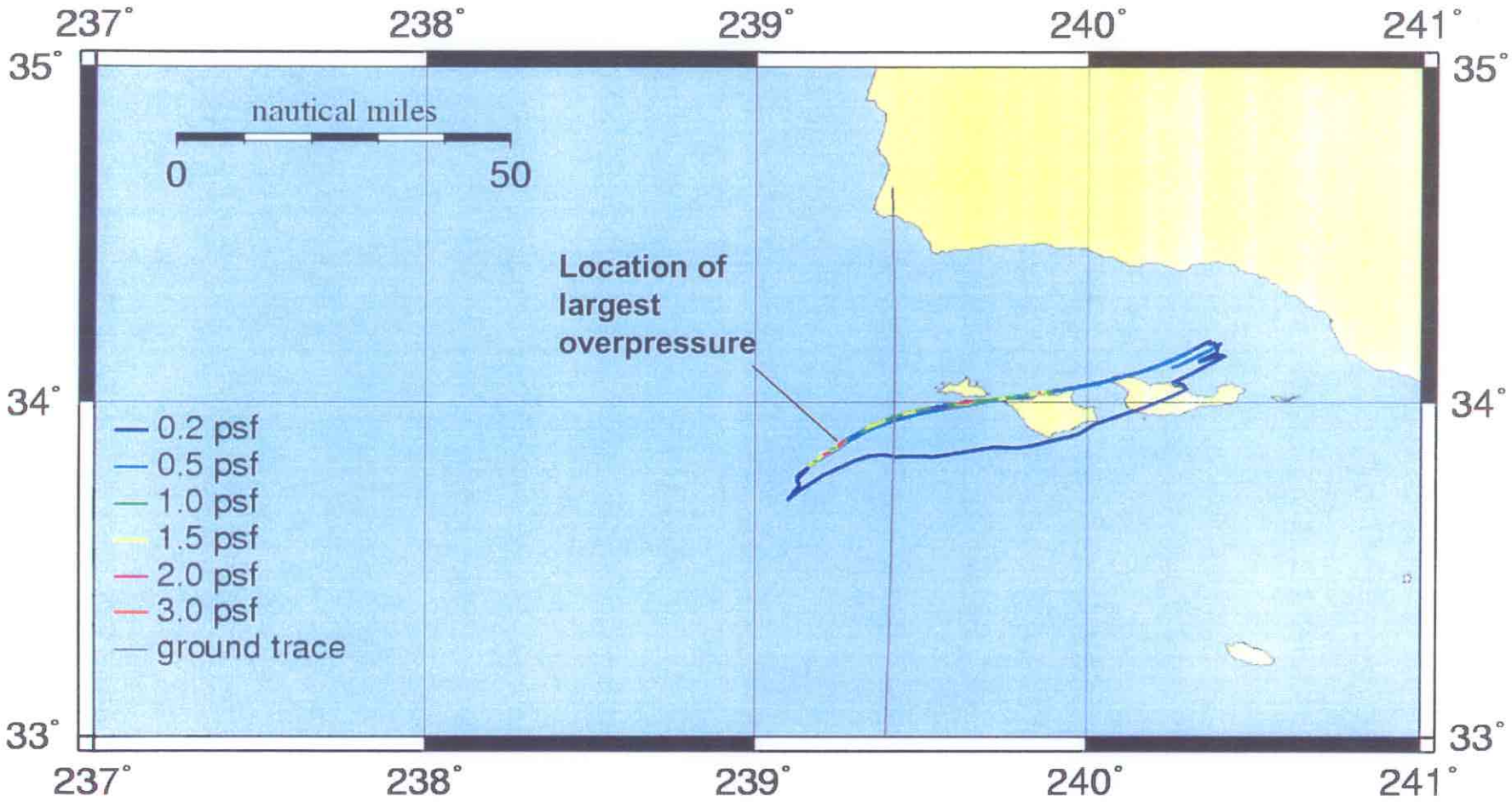
Peak Overpressure Contours for December Atmosphere and December Mean Winds - 175° Launch Azimuth

Largest peak overpressure of 2.02 psf



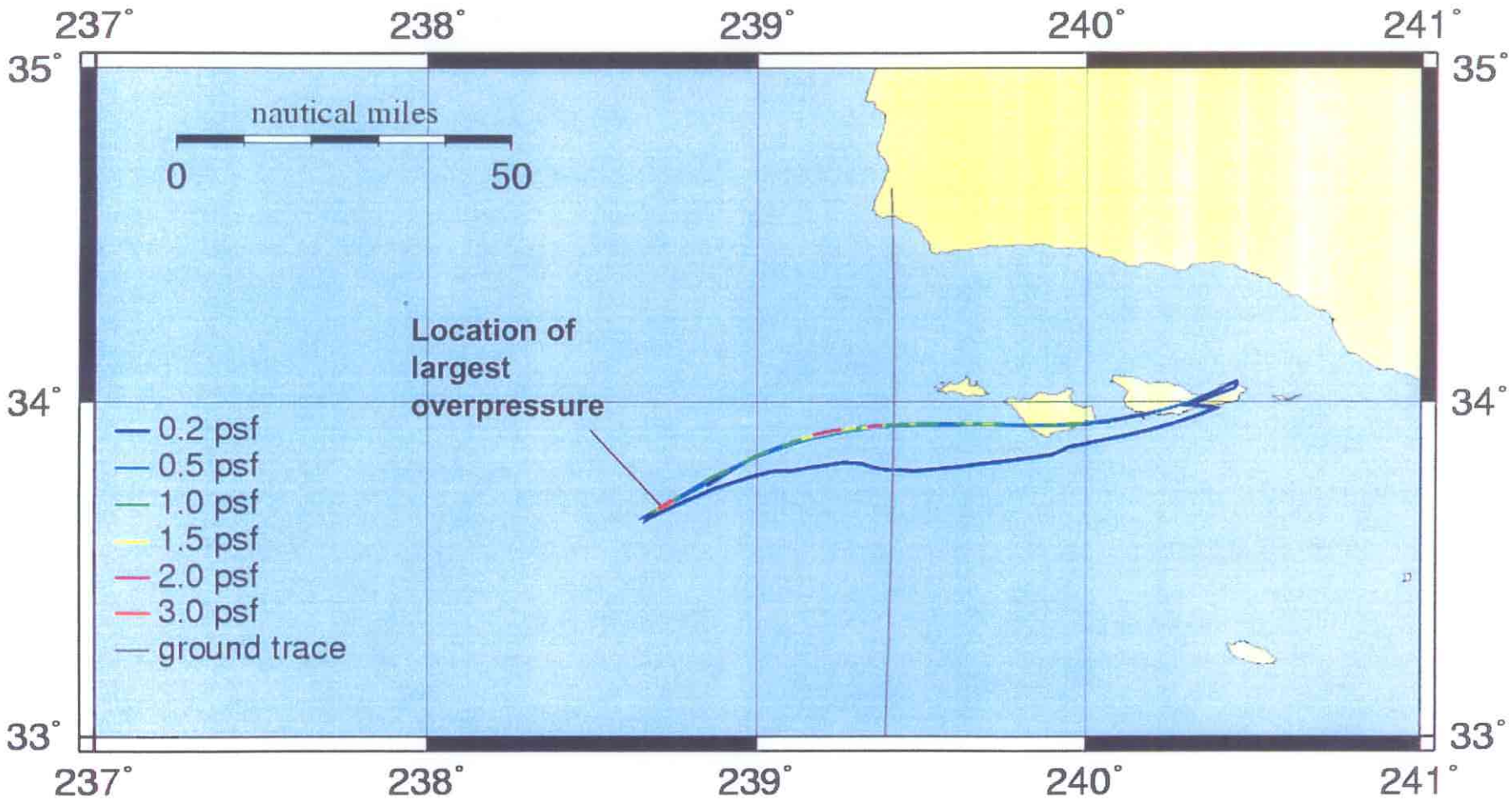
Peak Overpressure Contours for December Atmosphere and December +3 Sigma Winds - 175° Launch Azimuth

Largest peak overpressure of 10.14 psf



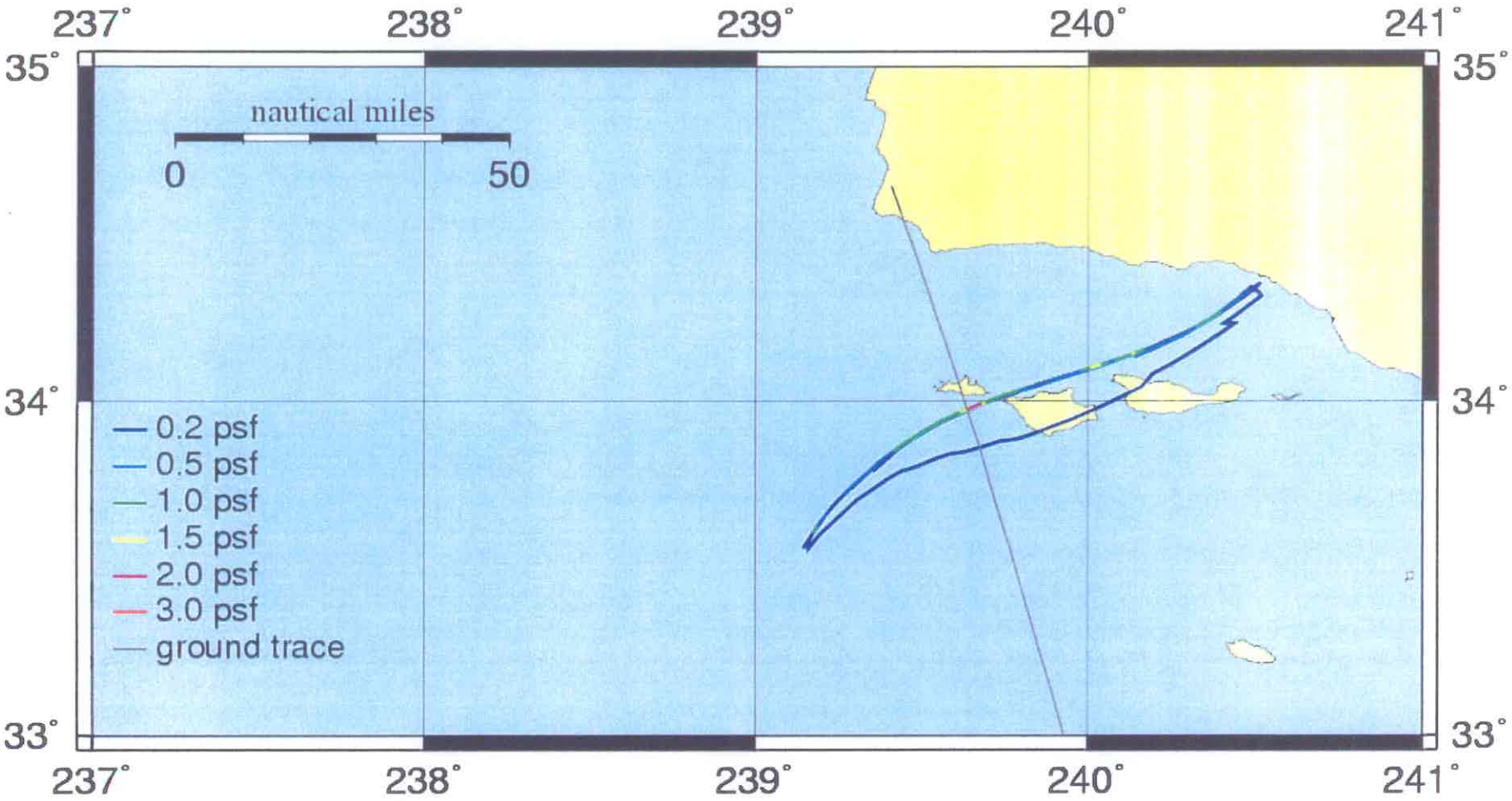
Peak Overpressure Contours for December Atmosphere and December –3 Sigma Winds - 175° Launch Azimuth

Largest peak overpressure of 8.92 psf



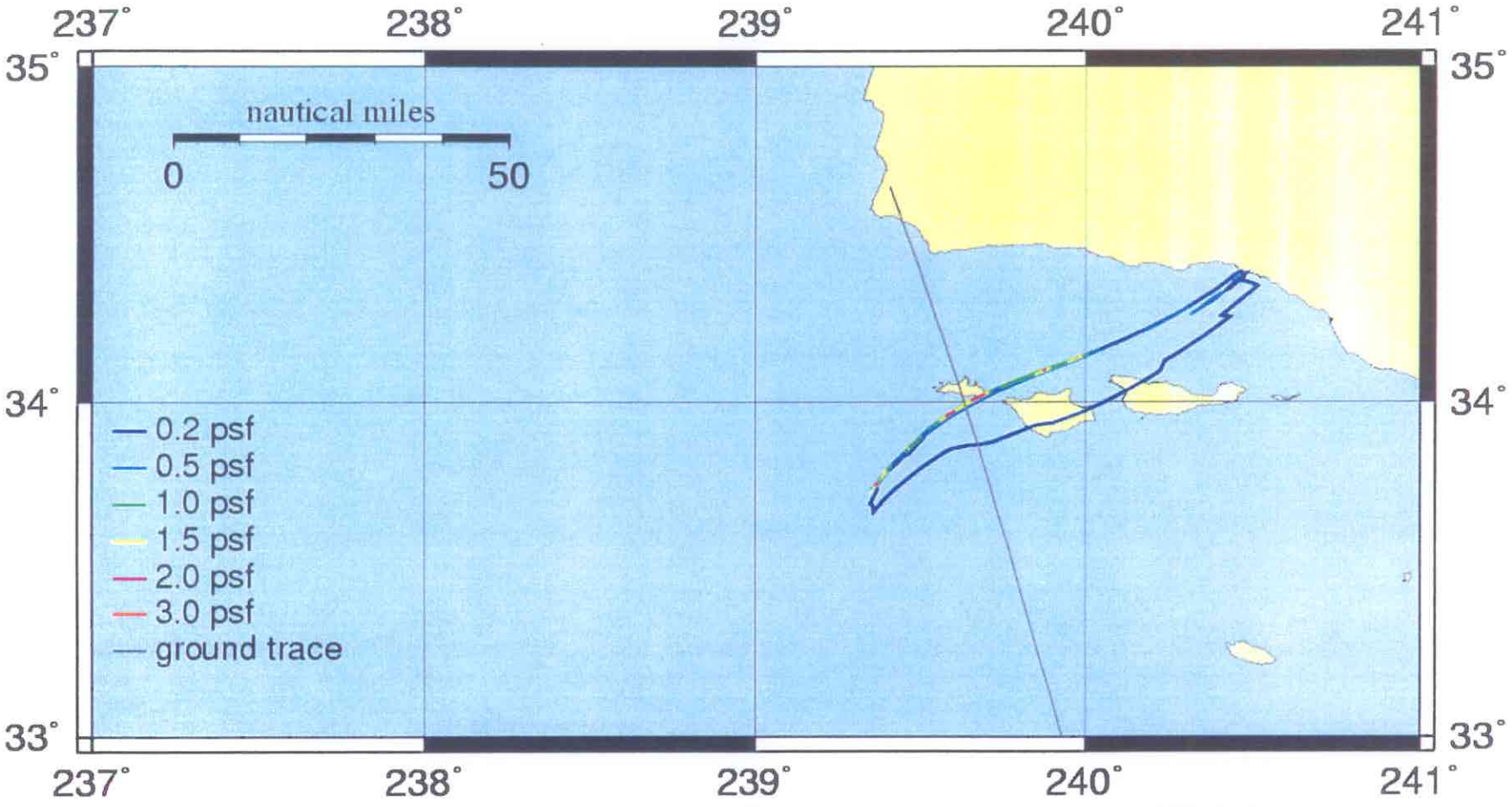
Peak Overpressure Contours for December Atmosphere and December Mean Winds - 160° Launch Azimuth

Largest peak overpressure of 2.65 psf



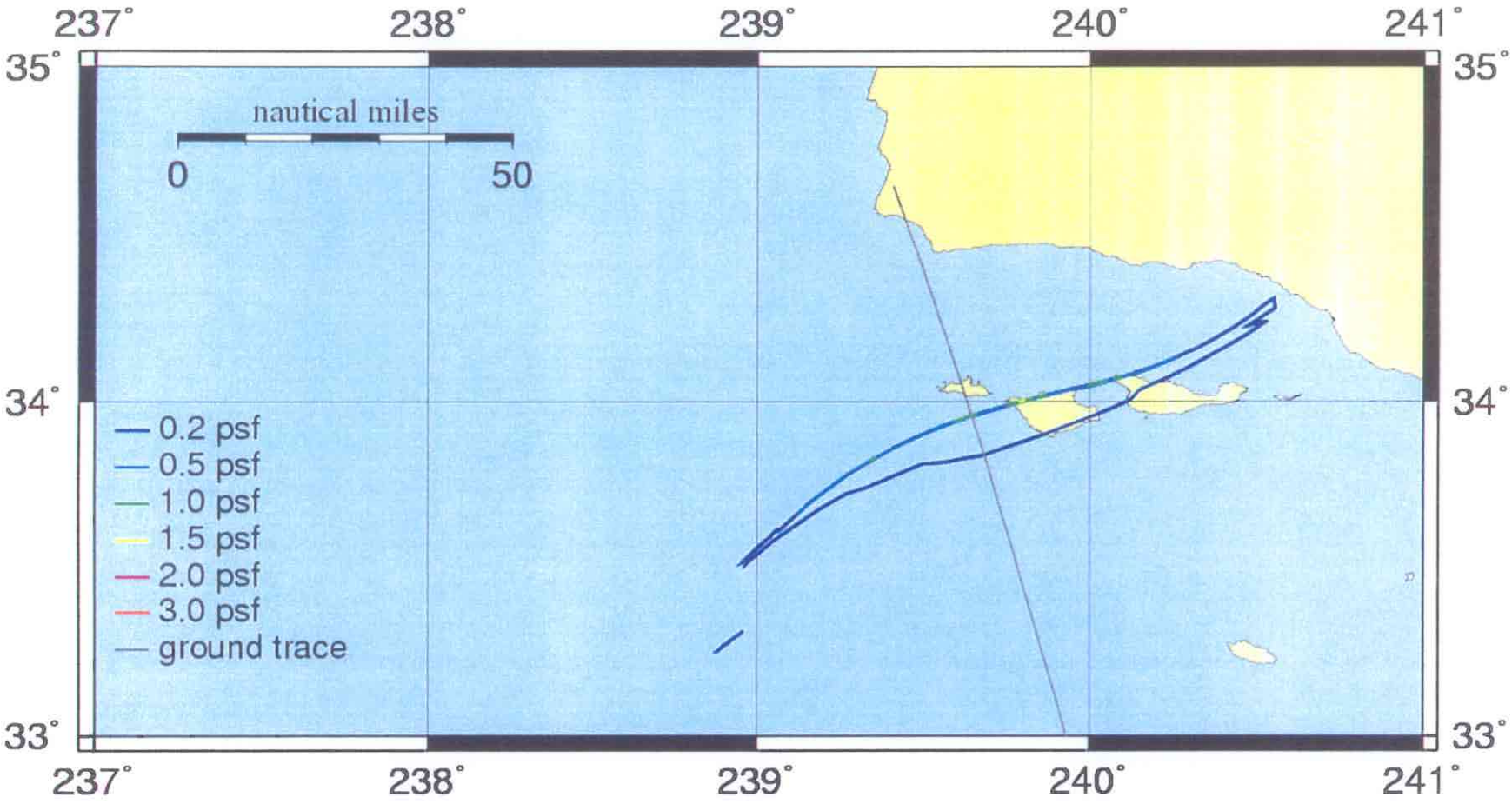
Peak Overpressure Contours for December Atmosphere and December +3 Sigma Winds - 160° Launch Azimuth

Largest peak overpressure of 2.48 psf



Peak Overpressure Contours for December Atmosphere and December –3 Sigma Winds - 160° Launch Azimuth

Largest peak overpressure of 1.67 psf



Discussion of Peak Overpressure Contours- December Winds

- Overpressure levels (on Islands) considered high for ≥ 2 psf
- For 190° launch azimuth, and +/- 3 sigma variability in December wind conditions
  - Largest overpressure on Islands is 1.0 psf on Santa Cruz and Santa Rosa
  - Largest peak overpressure is 7.05 psf, however this is for a very small area and occurs significantly far from Islands
- For 175° launch azimuth, and +/- 3 sigma variability in December wind conditions
  - Largest overpressure on Islands is 2.0 psf on Santa Rosa
  - Largest peak overpressure is 10.14 psf, however this is for a very small area and occurs significantly far from Islands
- For 160° launch azimuth, and +/- 3 sigma variability in December wind conditions
  - Largest overpressure on Islands is 2.3 psf on Santa Miguel
    - This is considered high overpressure level
  - Largest peak overpressure is 2.65 psf, however this is for a very small area and occurs away from Islands

Comparison Against Atlas IIAS and Titan IVB

Proprietary

			
Vehicle	Falcon	Atlas 2	Titan 4B
Company	SpaceX	Lockheed Martin	Lockheed Martin
GLOW	60,000 lbs	522,000 lbs	2,100,000 lbs
Length	70 ft.	155 ft.	204 ft.
Total 1st Stage Engine Thrust	67,000 lbf	438,000 lbf	3,000,000 lbf

Proprietary

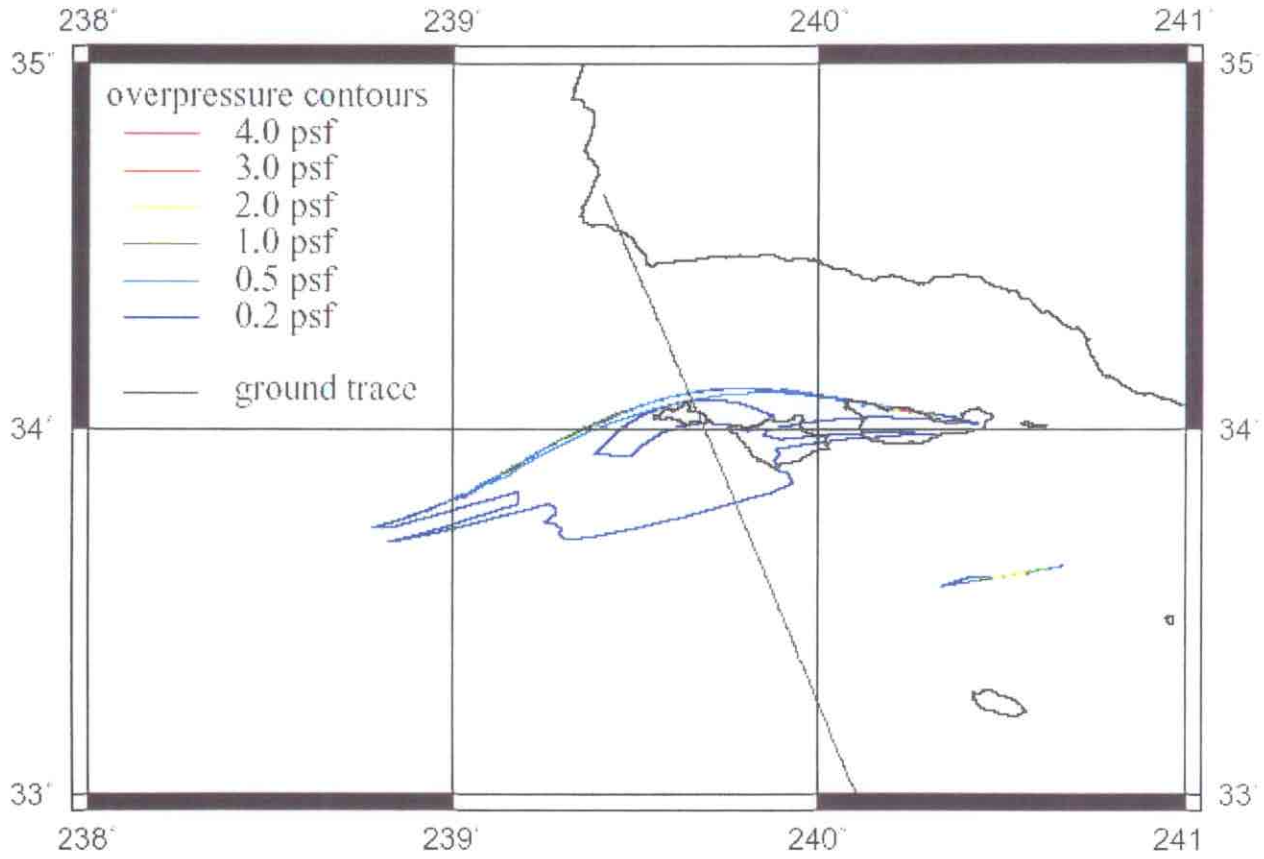
- Though Atlas IIAS and Titan IVB are an order of magnitude larger than Falcon, Aerospace has overpressure data for these for launches out of VAFB. They are therefore used for comparison.

Peak Overpressure Contours for Atlas IIAS

August
nominal winds

Launch Sept. 8,
2001

Launch
Azimuth 157°



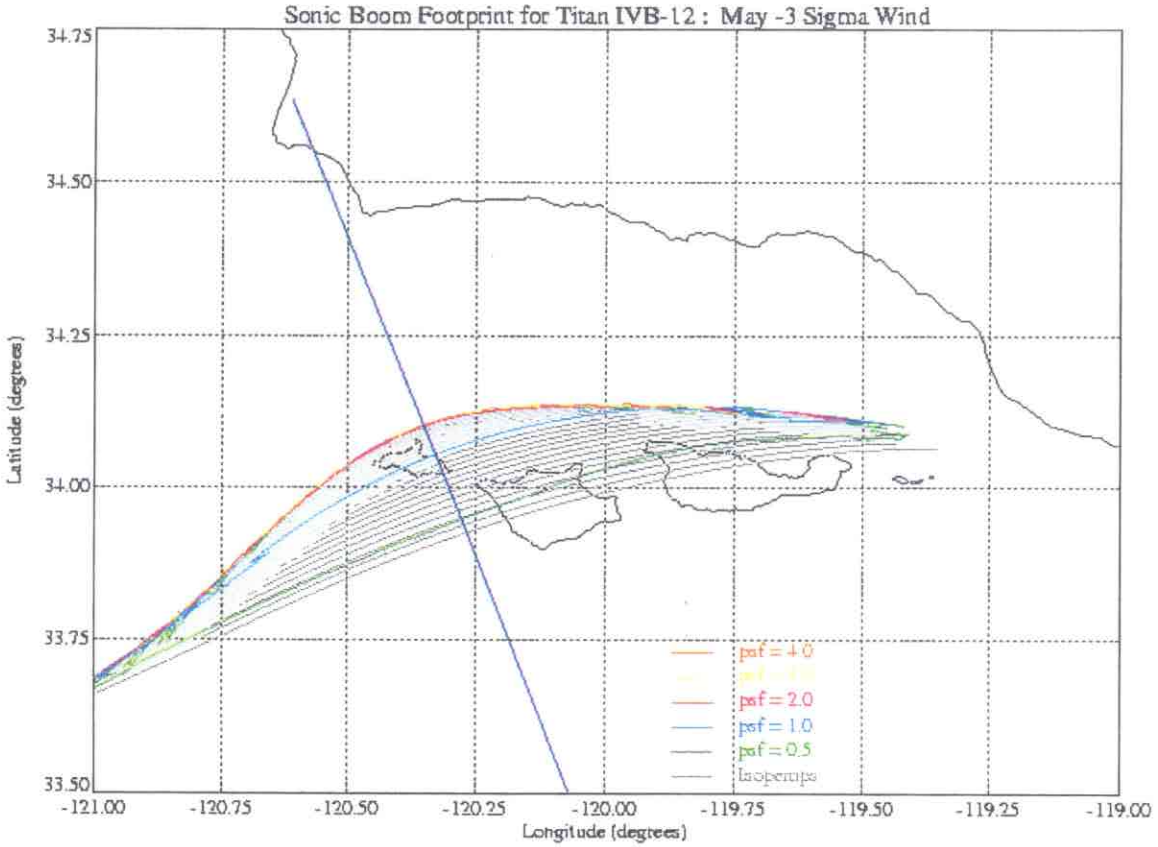
- Small region of 4.0 psf overpressure impacts northern tip of Santa Cruz Island

Peak Overpressure Contours for Titan IVB

May
–3 sigma
winds

Launch May
22, 1999

Launch
Azimuth 157°



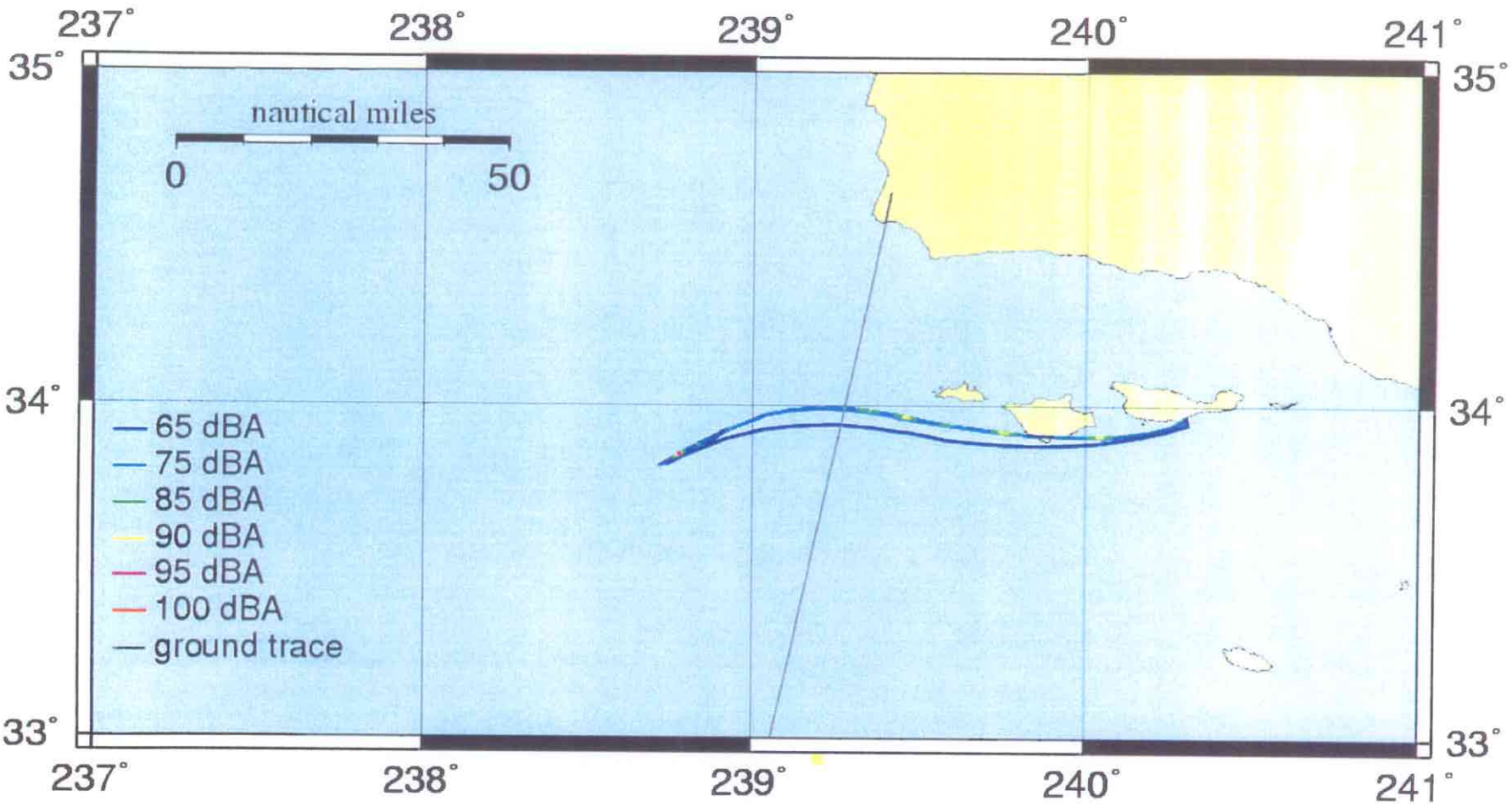
- Peak overpressure 4.0 psf
- 1.0 psf overpressure impacts San Miguel Island

A-Weighted Decibel Level Contour Maps- December

- The following plots use the data for the average (mean) winds in December
  - Simulations accounting for the variability in the December wind conditions (+/- 3 sigma) have not been run

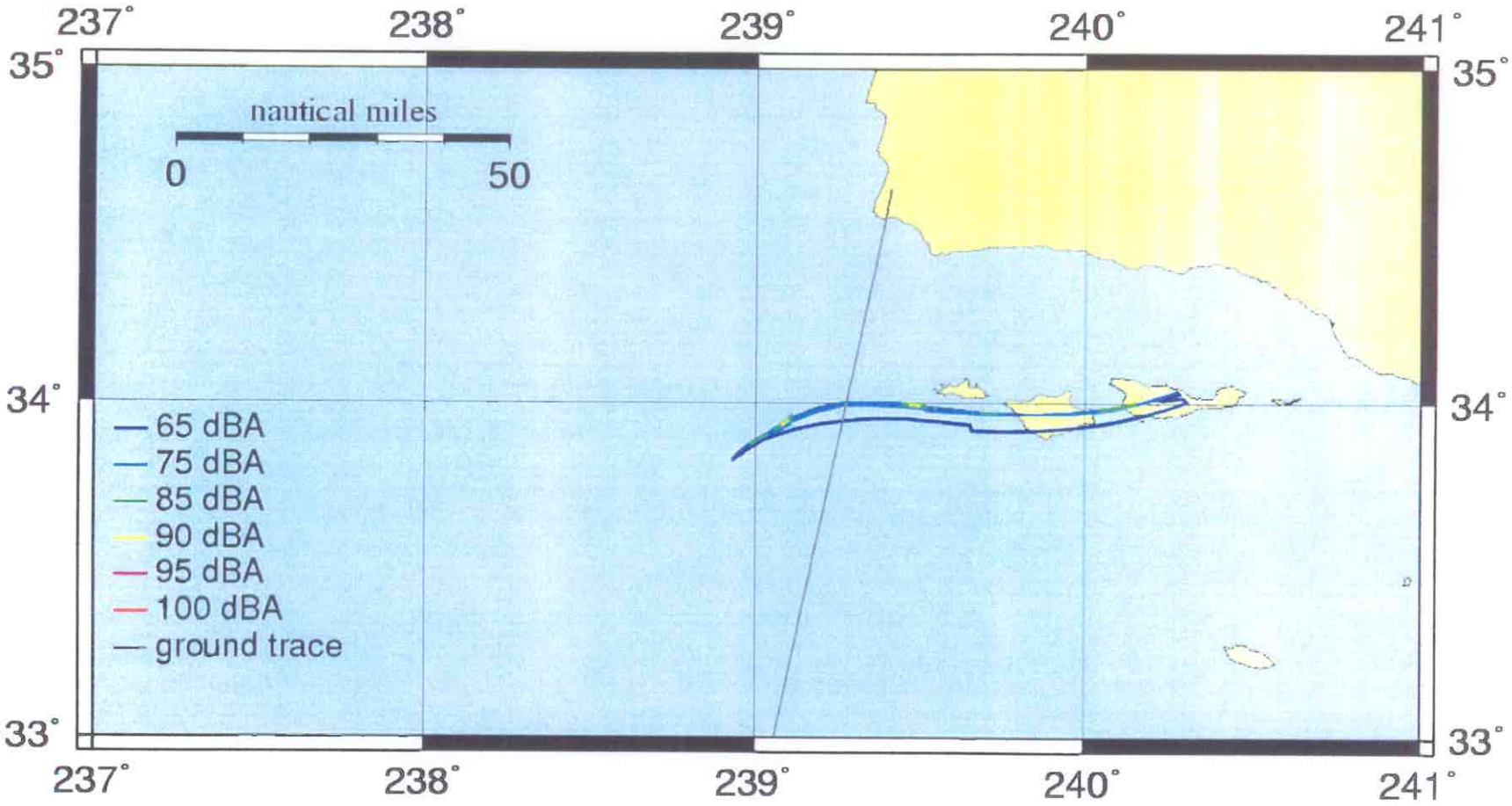
A-Weighted Decibel Level Contours for December Atmosphere and December Mean Winds - 190° Launch Azimuth

Largest A-weighted decibel level of 99.5 dBA



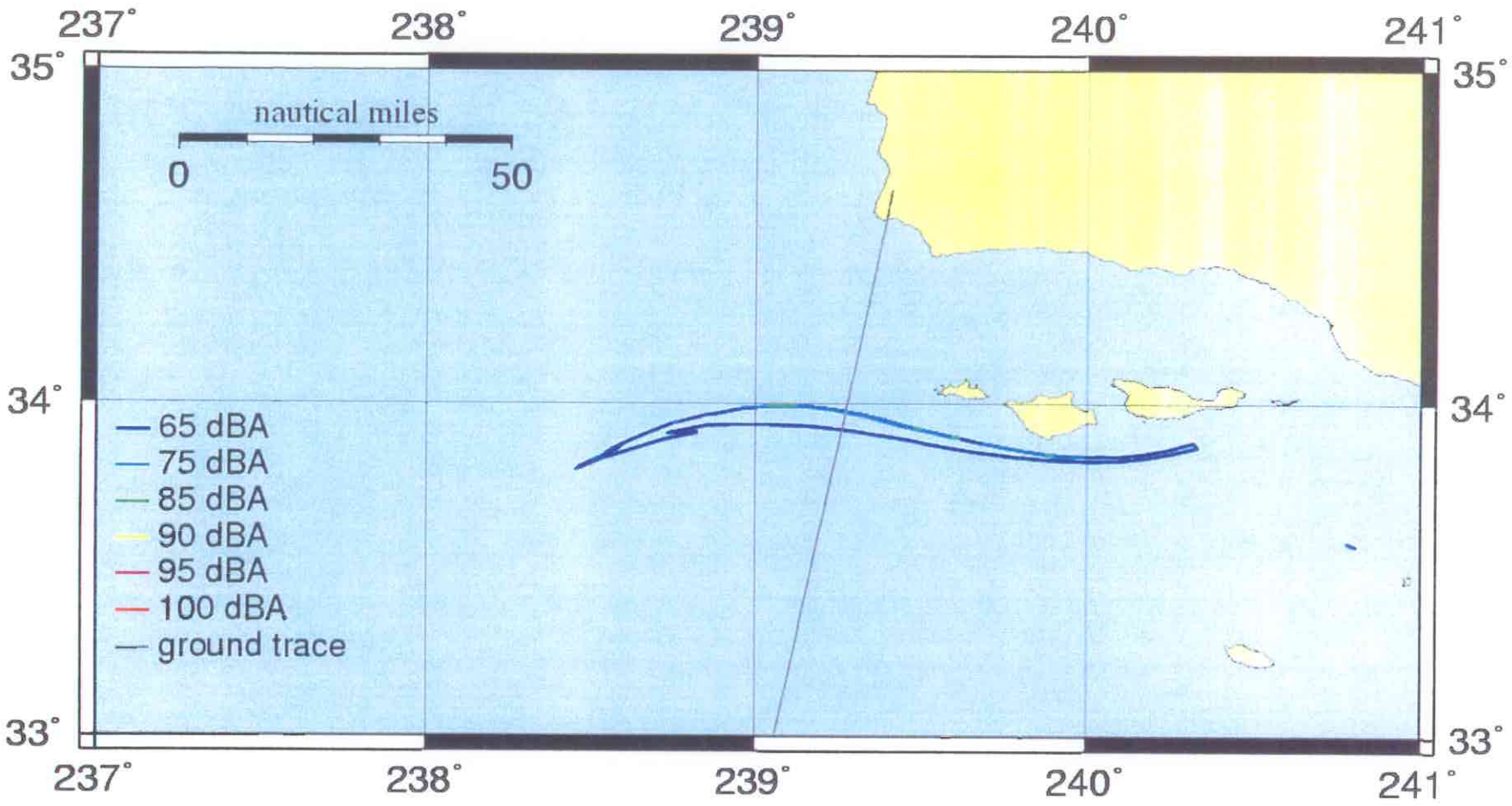
A-Weighted Decibel Level Contours for December Atmosphere and December +3 Sigma Winds - 190° Launch Azimuth

Largest A-weighted decibel level of 95.0 dBA



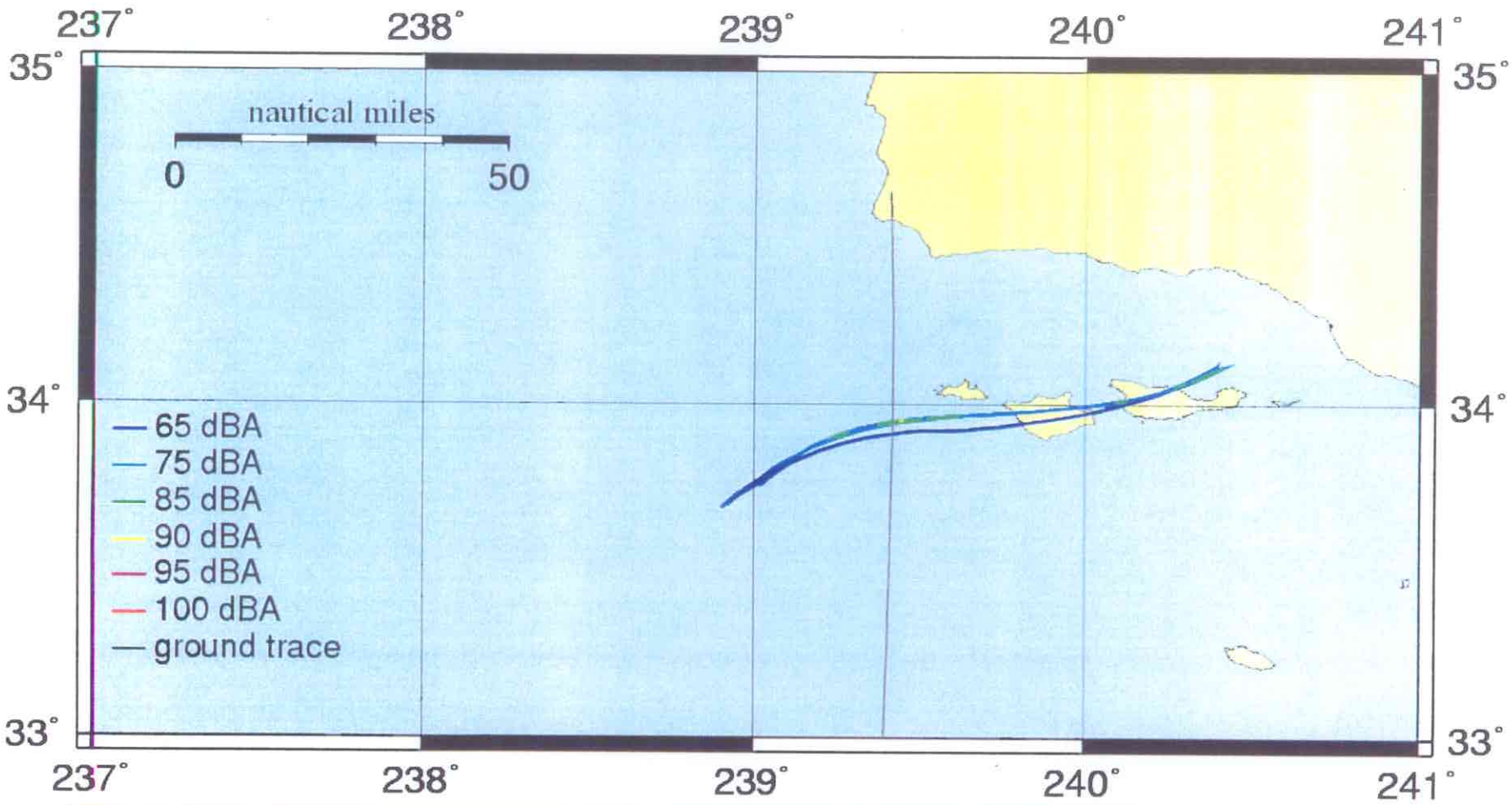
A-Weighted Decibel Level Contours for December Atmosphere and December –3 Sigma Winds - 190° Launch Azimuth

Largest A-weighted decibel level of 88.0 dBA



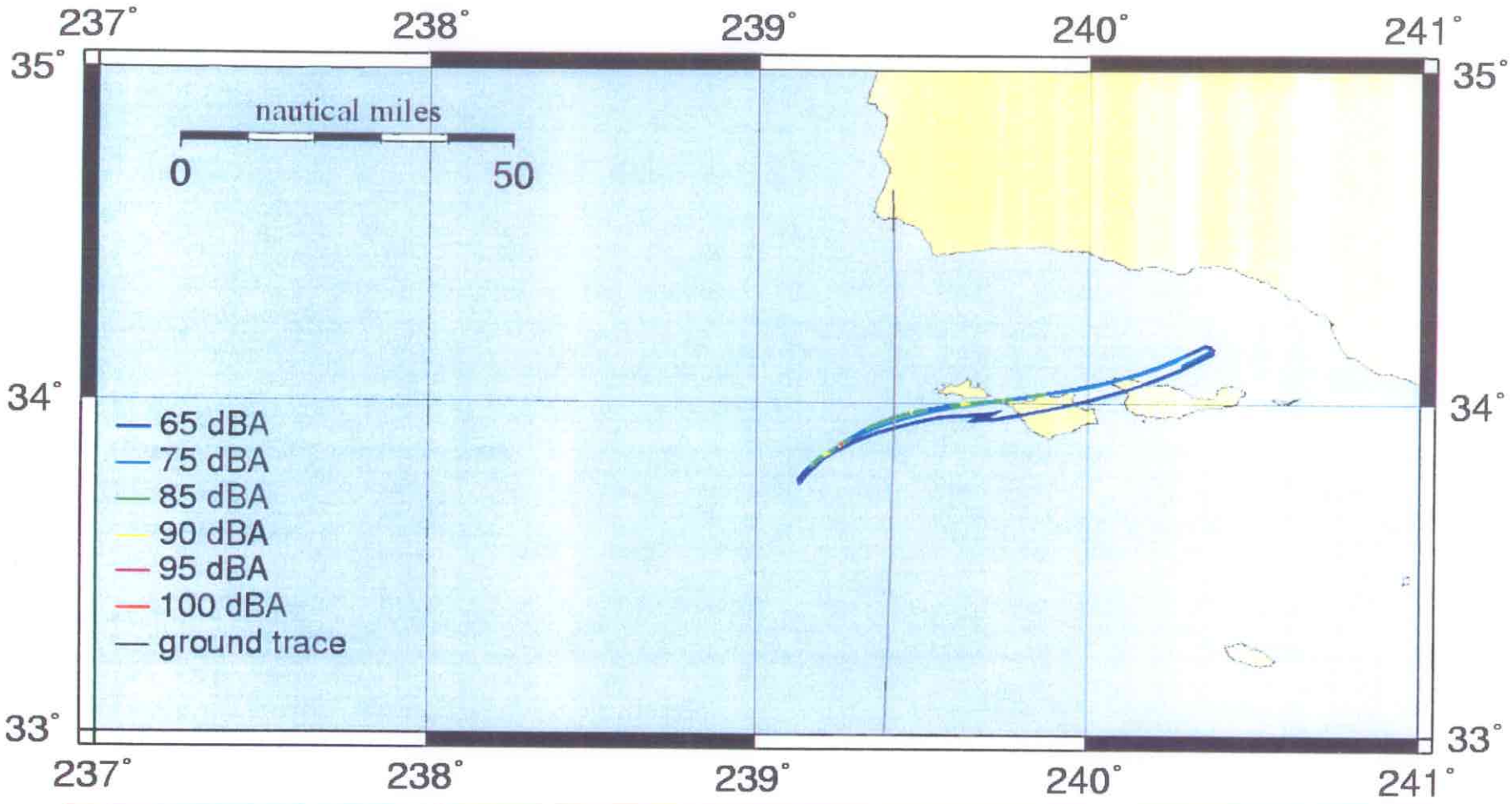
A-Weighted Decibel Level Contours for December Atmosphere and December Mean Winds - 175° Launch Azimuth

Largest A-weighted decibel level of 91.1 dBA



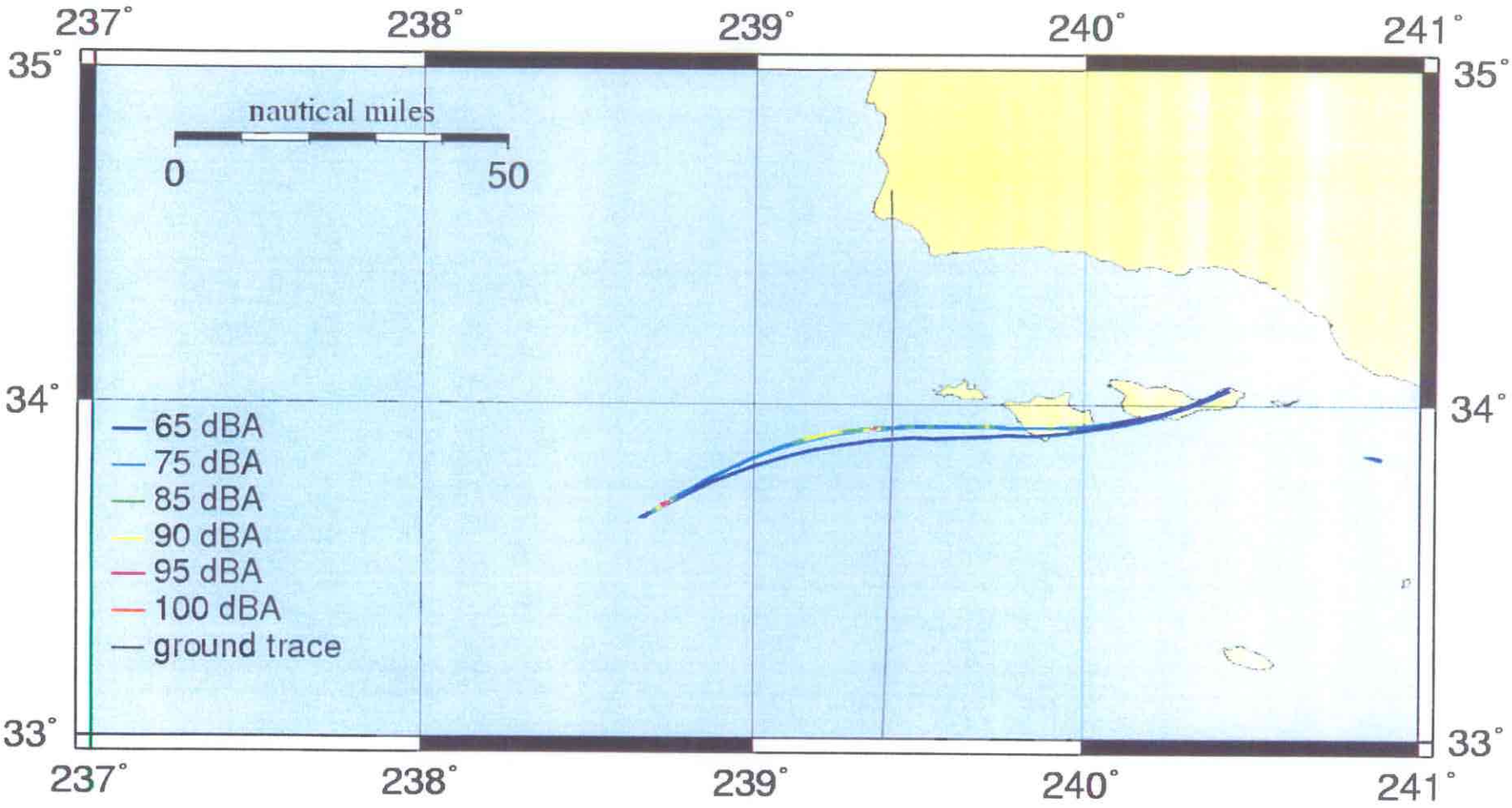
A-Weighted Decibel Level Contours for December Atmosphere and December +3 Sigma Winds - 175° Launch Azimuth

Largest A-weighted decibel level of 103.8 dBA



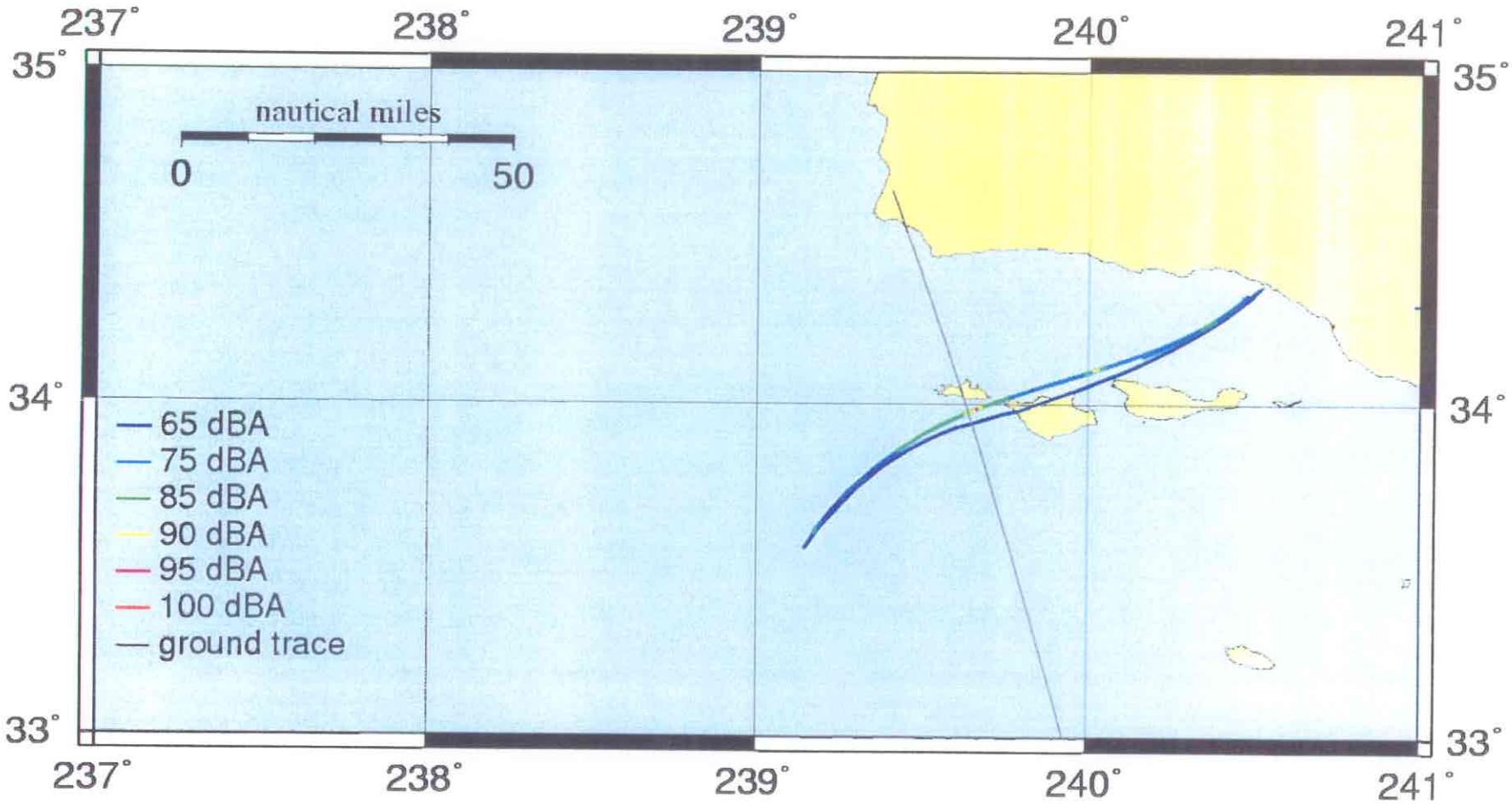
A-Weighted Decibel Level Contours for December Atmosphere and December –3 Sigma Winds - 175° Launch Azimuth

Largest A-weighted decibel level of 101.5 dBA



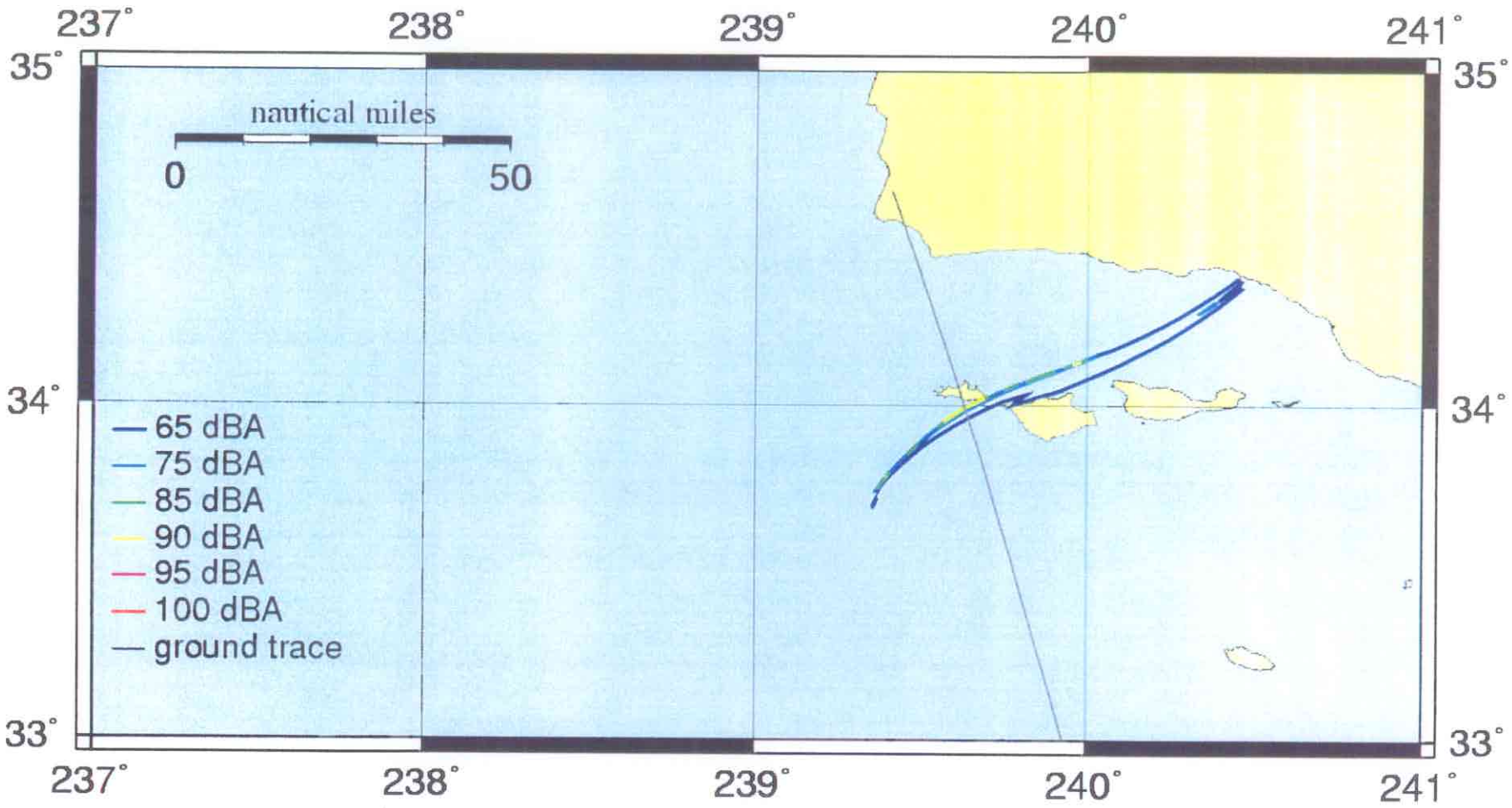
A-Weighted Decibel Level Contours for December Atmosphere and December Mean Winds - 160° Launch Azimuth

Largest A-weighted decibel level of 95.9 dBA



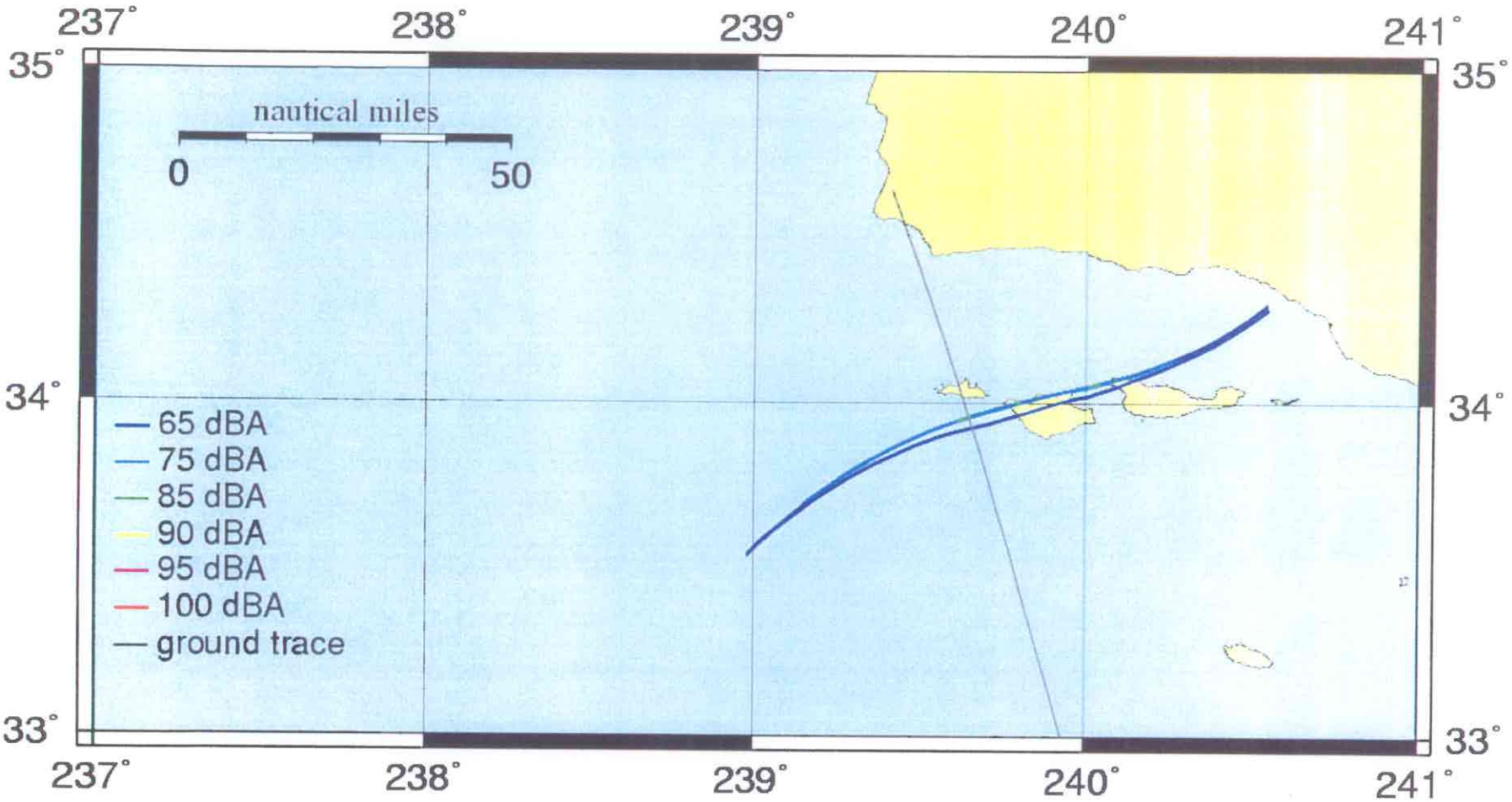
A-Weighted Decibel Level Contours for December Atmosphere and December +3 Sigma Winds - 160° Launch Azimuth

Largest A-weighted decibel level of 95.1 dBA



A-Weighted Decibel Level Contours for December Atmosphere and December –3 Sigma Winds - 160° Launch Azimuth

Largest A-weighted decibel level of 88.2 dBA



THE AEROSPACE CORPORATION

F REGULATORY AGENCY COMMENTS

Response to Comments on the
Public Draft EA For the Falcon Launch Vehicle Program – July 2003

Item	Page	Para./Fig./Table	Originator and Comment Number	Comment
Response				
1.		3.1 Land Use	SBCAPCD, 4	Describe the contractual agreement between the USAF (DoD) and Space X for use of VAFB real property, equipment, and services.
Revised to include a reference to the COSA which establishes the relationship between SpaceX and the Air Force				
2.		Section 3.3.3.2, Special Status Wildlife Species	Russell E. Galipeau, Jr. Superintendant, Channel Islands National Park, NPS, DOI	No mention is made to the fact that peregrine falcons and western snowy plovers breed on San Miguel and Santa Rosa Islands or that there are roosting colonies of brown pelicans on the northern Channel Islands. Bald eagles, a threatened species have recently been reintroduced to the northern Channel Islands. There are currently 14 juvenile bald eagles on the northern islands.

Item	Page	Para./Fig./Table	Originator and Comment Number	Comment
Response				
3.		Biology and Cultural Resources	Russell E. Galipeau, Jr. Superintendant, Channel Islands National Park, NPS, DOI	The biological and cultural resources of the park include internationally significant pinniped and seabird colonies, some of the oldest archeological sites in the Western Hemisphere, and unique geological landforms. The importance of these landforms is recognized in the designations of the National Park, National Marine Sanctuary, and International Biosphere Reserve. The islands were set aside to protect these significant resources and other features. These designations should be mentioned under the Affected Environment and assessment made regarding impacts to the values of the national park, national marine sanctuary and biosphere reserve. Land use on the island includes visitation by the public, land management, education, and research. Use of the nearshore marine environment at the islands includes substantial recreational activities and commercial fishing.

Item	Page	Para./Fig./Table	Originator and Comment Number	Comment
Response				
				equipment size/ratings or usage information provided. We request the EA be amended to include the emissions of these activities to determine the significance of air quality impacts for the total project.
The EA has been amended to include these emissions except space and water heating which have been eliminated from the proposed project description. The latter is now noted in the revised EA as well.				
5.		Air Quality, Section 3.5	SBCAPCD, 2	The use of any marine vessels associated with the stationary source would have to be included in the potential to emit calculations. The use of a salvage vessel recovering the first stage of the Falcon vehicle may fit this requirement. Please detail the operational characteristics of this vessel along with the engine ratings and emission calculations.
The salvage vessel will not enter Santa Barbara County. The vessel will operate out of San Diego, Long Beach or Port Hueneme. As such, significant impacts to local air quality are not expected.				
6.		Air Quality, Section 3.5	SBCAPCD, 3	Please be aware that SBCAPCD typically requires permits for the activities enumerated in SBCAPCD Comments #1 and 2. Depending on the potential to emit of the project, the project may be subject to Best Available Control Technology, Air Quality Impact Analysis and offsets. Please contact Michael Goldman, Engineering Supervisor, at 805-961-8821 if you have any permitting related questions.
Comment noted				
7.		Air Quality, Section 3.5	SBCAPCD, 5	Further, please note that the APCD will perform a CEQA analysis for this project. The scope of the APCD's document will depend on the extent that the Final EA addresses air quality related issues.
Comment noted				
8.	General	Environmental Consequences	Russell E. Galipeau, Jr. Superintendant, Channel Islands National Park, NPS,	Initial launches need to be carefully monitored and operations changed if monitoring shows impacts from the Falcon Launch Vehicle Program.

Item	Page	Para./Fig./Table	Originator and Comment Number	Comment
Response				
				Channel Islands. There are currently 14 juvenile bald eagles on the northern islands.
Please see response to comment 31 (Same comment).				
11.	4-24		Russell E. Galipeau, Jr. Superintendant, Channel Islands National Park, NPS	In the discussion of sonic booms over the Range, the statement that the maximum overpressure over Channel Islands National Park would be 2.0 psf over Santa Cruz Island under the 175-degree azimuth, is not in agreement with the discussion of peak overpressure controus-December winds (page 23, Appx. E) which states the "largest overpressure [for 175 degrees azimuth] is 2.0 psf on Santa Rosa Island." We also call your attention to the unique Caliche formations on San Miguel and Santa Rosa islands, which may be affected by high overpressure levels from sonic booms.
EA has been revised, "Santa Rosa". Potential impacts to caliche formations will be much less than from existing Altlas and Titan launch programs.				